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Car Shortage Grows—Page 1180

IRON TRADE REVIEW

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CLEVELAND, NOVEMBER 2, 1922

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The Eightieth Anniversary of Ryerson Steel-Service

EIGHTY years ago this month a pioneer, Joseph T. Ryerson, opened his first small store in a frontier town of six thousand people. Today a National Organization with plants in five cities celebrates the event.

With the experience and inspiration of these four-score years of business we look forward to new opportunities for increasing service in the years to come.

JOSEPH T. RYERSON & SON

CHICAGO ST. LOUIS DETROIT BUFFALO NEW YORK

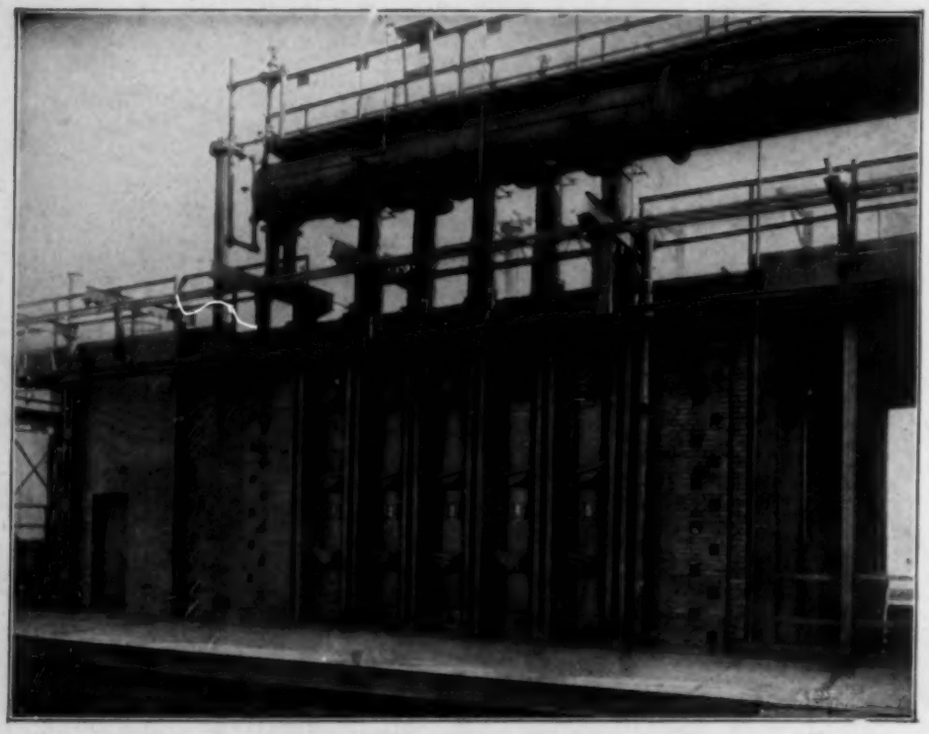
The By-Product Coke Industry Moves Forward

The Carnegie Steel Company has awarded The Koppers Company a contract to build a 366 oven extension to their by-product and coke plant at Clairton, together with a by-product plant and benzol motor fuel recovery plant. This is important as an indication of the general upward trend of business and the continued abandonment of the bee-hive oven as a source of coke supply.

Even more important is the Carnegie Steel Company's decision to build the New Type Koppers Company Combination Oven, a logical sequence of the remarkable performance of this oven since it was first placed in operation less than nine months ago.

There are now 408 ovens of this new design in operation or under construction, as follows:

Carnegie Steel Company, Clairton, Penn'a.	366 ovens
Weirton Steel Company, Weirton, W. Va.	37 ovens
Chicago By-Product Coke Co., Chicago, Ill.	5 ovens
Total	408 ovens



Battery of five NEW KOPPERS OVENS at
Chicago By-Product Coke Co., Chicago, Ill.

The KOPPERS COMPANY
Designers and Builders of
By-Product Coke & Gas Ovens
PITTSBURGH, PA.

IRON TRADE REVIEW

The Authority of Industry *National and International*

Vol. LXXI Cleveland, November 2, 1922 No. 18

Production Is Moving Forward

Improved Operating Conditions Enable Mills and Furnaces To Make Better Showing Though Obstacles Still Remain—Winter Outlook Is Uncertain—Softness of Market Continues Apparent—Railroad Demand for Equipment Is Feature

UNDER more favorable operating conditions production of iron and steel again is moving forward and the average is around 75 per cent with some plants on an 80 per cent basis. Car supplies at the congested points have been freer though still short and further inroads have been made into the tonnage of finished steel piled at the mills. At Pittsburgh in some cases this reduction of accumulations has been 30 to 40 per cent. Pig iron shipments from merchant furnaces more closely balance current output. Fine weather conditions have been an important factor in keeping fuel supplies equal to demand but little opportunity has been afforded to build up stocks of coal. Because of this, fear is expressed that intermittent banking of blast furnaces with consequent unsettlement of operations, will be forced when the usual winter obstacles appear. Labor shortages though not acute are a cause of growing concern.

The coke market is more stable this week. While some brands have been sold lower, $8 Connellsville, ovens, is the minimum price on standard furnace coke. Production still is on the increase and offerings have increased materially.

The sag of the general market again is set forth by IRON TRADE REVIEW composite of fourteen iron and steel products which this week has fallen to $43.08. This compares with $43.42 one week ago, with the high point of $44.07 four weeks ago and the low level for the year of $32.80 the third week of March.

Many Cars Pending

Railroad equipment demand has continued to expand impressively and pending inquiries for cars total 45,000 to 50,000 requiring about 500,000 tons of steel with the prospect of a large eastern system entering the market soon for 30,000 cars additional. This is the largest total inquiry for cars at one time ever known with the exception of the time when the railroad administration in 1918 did its bulk buying of 100,000 cars for all the roads. New requests from the railroads for bids this week call for 15,000 cars. Awards are not keeping pace with inquiry, however, and it is indicated the roads are trying to develop lower steel prices. Considerable locomotive business is being placed, the Illinois Central placing 85.

Mixed Steel Demand

Steel bars are in good demand from a wide variety of miscellaneous sources with the automotive plants, railway car and locomotive builders and nut, bolt and rivet manufacturers drawing on the mills for heavy tonnages. Some improvement is shown in the buying by the agricultural implement industry. Plate and structural shape business has fallen off and the mills are more anxious for orders. Pipe mills are flooded with tonnage of the buttweld merchant class which registers the widespread construction of dwellings. Deliveries now quoted are 8 to 12 weeks. Demand for automobile sheets keeps up well but black and galvanized inquiry is considerably less.

These conditions are making for a mixed price situation. Softness has continued to appear in sheets, excepting fine finished and also in plates, structural shapes and light rails. Tubular goods and tin plate are strong and wire products firm. Iron pipe in less carloads has been advanced $2 per ton. Wire rods have become scarce with some mills quoting and in cases, obtaining $50 Pittsburgh.

Structural awards are reflecting the waning building season but the total this week was fair at about 17,000 tons and includes some good-sized jobs such as 6000 tons for the Virginian railroad coal pier at Norfolk, 2700 tons for a newspaper building in New York and 2300 tons for a hotel at Chicago.

Iron Works Lower

Pig iron has shown further softening, with light buying. The most precipitate change is in tern Pennsylvania where a round tonnage of basic has been sold $2 to $2.50 lower. Buffalo iron has been sold at $29 to $29.50 and an Ohio lake producer has taken malleable at the latter figure. Southern Ohio iron is off $1 or more. Alabama iron now is generally quoted at $27 Birmingham with one maker naming $26.50 for quick delivery. Ohio silveries and bessemer ferrosilicon have been reduced $2 per ton.

Business Trend and Chart Section Page 1179

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Getting Back To the Law

IN HIS address before the American Iron and Steel institute, Judge Gary based his philosophy of business and economic life upon the fundamental law of supply and demand. He pointed out that many of the ills of the disturbed world of the present day can be attributed to interference with or disregard of this controlling principle. In the end, the force of the law must prevail, however, and all excesses and artificial standards raised in resistance to it, must be paid for by loss, suffering and wasted opportunity notably to those who are responsible, but also to an innocent public.

What Judge Gary stressed was the pressing necessity for the return to first principles. He emphasized the importance of integrity of service, of industry and thrift, of observance of law and finally of common sense. Only on the basis of full value given for that demanded and received can best success and prosperity be achieved.

One has only to let his mind run to the heavy loss and great injustice growing out of the recent strikes in the coal and railroad industries to perceive the full force of Judge Gary's preachment. The settlement of the coal strike especially was in defiance of the law of supply and demand and of economic justice. Many strikes and lockouts as well are indefensible because they reveal a determination to acquire a selfish and in a broad sense, dishonest advantage, however temporary that might be. But it is not alone in wage and labor relations that this disregard for fundamental principles has been exhibited. Many manufacturers in their zeal to advance their individual interests and out of motives of cupidity, have been guilty of conspiracies and combinations to suppress natural laws. Legislation which is sought to correct abuses in behalf of the common good frequently defeats its own purpose by interfering with the free conditions of work and trade.

The antidote that Judge Gary proposes for the prevailing conditions is full publicity to all matters of business and trade relationships affecting the public welfare. He urged that the right of inspection of such affairs should be vested in a competent, disinterested and non-partisan body. The iron and steel industry has been notably liberal in its attitude toward publicity to its various operations. It is a question whether any large branch of business today conducts its affairs with more openness and more access by the public than the iron and steel industry. No single interest has been more painstaking and progressive in this policy than the great corporation over which Judge Gary exercises the guiding hand. His position on publicity, therefore, is thoroughly consonant with his own practice.

The country proverbially waits with great interest and respect when Judge Gary speaks on economic questions. On this occasion in recognition of the unsettled conditions of a reconstructing world, his address was pitched on a broader plane than customarily. Seldom, however, has he displayed to better advantage his remarkable gift of leadership in constructive thought which has gained for him recognition as a business statesman. As usual, his address was the crystallizing force that has made the meetings of the American Iron and Steel institute so notable and important to the country at large.

Statistics Aid Zinc Recovery

THE zinc industry has experienced a remarkable recovery in the past 15 months, from a condition of extreme depression to one of comparative comfort. Production continues at only a small percentage of theoretical capacity, but eliminating the capacity which is a factor only in extreme bull markets, the present operations measure up well with those of the steel and other metal industries. Current zinc consumption in this country is estimated at a yearly rate of about 360,000 tons, against 340,341 tons in 1912, the best prewar year.

While the improvement in general business has been responsible for the gains in zinc, another

factor deserves attention because of its steadying and stabilizing influence. Through this, the zinc industry has been enabled to reap the full benefits of the business improvement. This is the work of the American Zinc institute in disseminating to its members and to the public accurate monthly statistics showing stocks on hand and monthly production and shipments. The element of uncertainty in these matters has been removed, so that smelter operators have not been tempted to gamble on the future by resuming production prematurely. At the same time the definite knowledge available has made possible the gradual broadening of production in line with current needs, as prices have warranted.

In July, 1921, smelters' stocks of slab zinc amounted to 92,408 tons, while in the same month prime western sold at 4.12½ cents per pound, compared with an average price for the past 30 years of 6.10 cents per pound. The smelters then were producing at a rate of less than 180,000 tons annually. Although the earlier months of 1921 production had exceeded shipments, beginning with August, shipments began to improve. In no month since that time has production been less than shipments. In other words, there has been a steady reduction in stocks for the past 15 months. The latest figures of the institute, issued as of Sept. 30, showed stocks on that date of 18,806 tons, or about two week's supplies, based on the September shipments of 35,957 tons. Prices during the past 15 months have advanced to 7.12½ cents at the present time. Surface indications during the coal and traffic troubles sometimes have pointed to a shortage of zinc but definite knowledge of the statistical situation of the industry has kept prices stable and has prevented unrestrained advances, which in the long run are disastrous.

If a demonstration of the practical value of the American Zinc institute as a functioning organization and its policy of publicity has been necessary, recent events have given it with positive force.

Rely on New England Coke

WHEN the New England by-product coke producers recently opened their books for the first half of 1923, foundrymen lost no time in placing their requirements for that period and practically the whole industry in that district now is covered up to the middle of next year.

Probably there is no other section of the country in which consumers participate so generally in covering their forward requirements. There are two reasons for such a concerted buying movement in New England. In the first place, consumers have learned through bitter experience that the railroad gateways are incapable of accommodating all of the traffic into New England. They have learned that their supply of coke is more certain when the coke is made in New England from coal transported to New England by water. Furthermore, the consumers have learned that the by-product coke in New England is of dependable quality.

The by-product coke situation in New England is a good example of the tendency in recent years toward localization of industries with respect to raw materials. In respect to no other raw material is such localization more desirable than it is as to coke. The fact that coke is produced with the gas that is made for domestic purposes has prevented much loss to foundry output which would have been occasioned if the foundry industry had been forced to continue dependent upon the Pennsylvania and other beehive districts. New England not only benefits as a whole from elimination of the wasteful beehive methods, but its great foundry industry, from the standpoint of having a dependable coke supply, is compensated to some extent for the disadvantage of having to obtain raw materials outside.

Furnace Extension Uneconomic

ADDITIONS to merchant blast furnace capacity promise to be small during the next few years as difficulties of financing construction stand in the way. At present a modern blast furnace plant of 400 to 500 tons daily capacity will cost $2,500,000 to $3,500,000, depending on the completeness of the plant and its location.

The production of such a furnace would be between 150,000 and 180,000 tons of iron per year, and the burden of overhead must rest on this tonnage. For interest on the investment, taxes, upkeep and similar items about 12 per cent per year must be provided, this being a conservative allowance. About $420,000 per year is required to cover this portion of the overhead, or about $2.50 per ton of iron produced.

This means that to the total cost of producing and marketing the iron $2.50 per ton must be added before any profit can be obtained. Under circumstances usually obtaining in the pig iron market this is a heavy burden. Selling of the production of a furnace makes it necessary at times to book tonnage at actual cost or below, and when this is done the average price received often comes close to the cost line.

With the probability that 1923 will be a year of declining values the difficulty in maintaining a burden of $2.50 per ton overhead on the cost of the furnace will be accentuated. What might be carried easily on iron at a level of $25 to $30 per ton would be problematical with iron at $15 to $20 per ton, as seems likely to be the level in years to come as liquidation proceeds.

This situation is a strong barrier against active enlargement of merchant pig iron production, and no great expansion can be looked for in this field.

Composite Market Average

Representing the Combined Average Prices per Ton of Fourteen Leading Iron and Steel Products, Yesterday, One Week, One Month, Three Months, One Year and Nine Years Ago

November 1, 1922	October 25, 1922	September, 1922	July, 1922	October, 1921	October, 1913
$43.08	$43.42	$43.79	$37.50	$35.46	$24.91

Products Included Are Pig Iron, Billets, Slabs, Sheet Bars, Wire Rods, Steel Bars, Plates, Structural Shapes, Black, Galvanized and Blue Annealed Sheets, Tin Plate, Wire Nails and Black Pipe

SCRAP PRICES, PAGE 1238, WAREHOUSE, PAGE 1230, ORE, NUTS, BOLTS AND RIVETS AND PIPE PRICES, PAGE 1234

Iron and Steel Prices

Pig Iron

Bessemer, valley	$33.00
Bessemer, Pittsburgh	34.77
Basic, valley	30.00
Basic, Pittsburgh	31.77
Basic, Buffalo	30.00
Basic del., eastern Pa.	28.50 to 29.00
Malleable, valley	30.00 to 31.00
Malleable, Pittsburgh	31.77 to 32.77
Malleable, Chicago	31.00
Malleable, Buffalo, furnace	29.50 to 30.00
Malleable, del., eastern Pa.	31.25 to 32.25

FOUNDRY IRON SILICONS

No. 2 Northern	1.75 to 2.25
No. 2 Southern foundry	1.75 to 2.25
No. 2X East'n and Virginia	2.25 to 2.75
No. 1X Eastern	2.75 to 3.25
No. 1 Chicago	2.25 to 2.75
No. 2 foundry Eastern	1.75 to 2.25

No. 1X, eastern del. Phila.	32.13 to 33.64
No. 1X, Buffalo	30.50 to 31.00
No. 2 foundry, valley	30.00 to 31.00
No. 2 foundry, Pittsburgh	31.77 to 32.77
No. 2 foundry, Buffalo	29.50 to 30.00
No. 2 foundry, Chicago	31.00
No. 2 foundry, Granite City	33.00 to 34.00
No. 2 foundry, Ironton furnace	31.00
No. 2 foundry, Cleveland del.	32.50
No. 2 foundry, del., Phila.	30.13 to 31.64
No. 2 foundry, N. J. tidewater	30.13 to 33.02
No. 2X, eastern del., Phila.	31.13 to 32.64
No. 2X, east. N. J. tidewater	31.13 to 34.02
No. 2X, eastern del. Boston	36.65 to 38.65
No. 2X foundry, Buffalo fur.	30.00 to 30.50
No. 2X, Buffalo del. Boston	37.91 to 38.91
No. 2 southern, Birmingham	27.00
No. 2 southren, Cincinnati	31.05
No. 2 southern, Chicago	33.01
No. 2 southern, Philadelphia	34.80
No. 2 southern, Cleveland	33.01
No. 2 southern, Boston (rail)	36.61
No. 2 southern, St. Louis	32.17
No. 2X, Virginia furnace	33.00
No. 2X, Virginia Philadelphia	38.17
No. 2X, Virginia Jersey City	38.54
No. 2X, Virginia Boston	38.92
Gray forge, eastern Pa.	29.00 to 30.00
Gray forge, val. del. Pitts.	30.77 to 31.77
Low phos., standard, valley	37.00 to 38.00
Low phos., standard, Phila.	41.00
Low phos., Lebanon furnace	35.00 to 37.00
†Low phos., British tidewater	28.75 to 30.75
Charcoal, Birmingham	32.00 to 35.00
Charcoal, Superior, Chicago	36.15

Silvery Iron
Jackson County, Ohio, furnace

8 per cent	$39.50
9 per cent	41.50
10 per cent	43.50
11 per cent	46.80
12 per cent	50.10

Bessemer Ferrosilicon
Jackson County, Ohio, furnace

10 per cent	$48.50
11 per cent	51.80

Ferroalloys

Ferromanganese, 78 to 80 per cent domestic, f.o.b. furnace	$100.00
†Ferromanganese, British delivered, Pittsburgh	105.89
†Ferromanganese, 80 per cent, English, c.i.f. Atlantic port	101.10
Spiegel, 19 to 21 per cent furnace spot nominal	37.00 to 38.00
†Spiegel, 20 per cent English, c.i.f. Atlantic port	38.50
Ferrosilicon, 50 per cent contract freight allowed	70.00 to 75.00
Ferrotungsten, standard, per pound contained	95.00 to 100.00

†Duty paid.

Ferrochrome, 60 to 70 chromium, 4 to 6 carbon, per pound contained, makers plant	12.00c to 13.00c
Imported ferrochrome, 4 to 6 per cent carbon	12.00c
Ferrovanadium, 30 to 40 per cent per pound estimated, according to analysis	$3.50 to $4.00
Ferro carbon-titanium, carloads, producers plant, per net ton	$200.00

Coke

Beehive, Ovens

Connellsville furnace	$8.00 to 8.50
Connellsville foundry	9.50 to 10.00
Pocahontas furnace	10.00 to 11.00
Pocahontas foundry	11.00 to 12.00
New River furnace	9.00 to 10.00
New River foundry	13.00 to 15.00
Wise county furnace	9.00 to 10.00
Wise county foundry	12.00 to 13.00
Alabama furnace	7.50 to 8.50
Alabama foundry	8.00 to 9.00

By-Product

Foundry, Newark, N. J., del.	$12.91
Foundry, Chicago, ovens	13.50
Foundry, Boston, delivered	16.50
Foundry, Granite City, Ill., ovens	14.00
Foundry, Alabama	8.50 to 10.00

Semifinished Material

BILLETS AND BLOOMS
(4 x 4-inch)

Open-hearth, Pittsburgh	$40.00
Open-hearth, Youngstown	40.00
Open-hearth, Philadelphia	45.17
Bessemer, Pittsburgh	40.00
Bessemer, Youngstown	40.00
Forging, Pittsburgh	45.00 to 50.00
Forging, Philadelphia	50.17

SHEET BARS

Open-hearth, Pittsburgh	$40.00
Open-hearth, Youngstown	40.00
Bessemer, Pittsburgh	40.00
Bessemer, Youngstown	40.00

SLABS

Pittsburgh and Youngstown	$40.00

WIRE RODS AND SKELP

Wire rods, Pittsburgh	$45.00 to 47.50
Grooved skelp, Pittsburgh	2.00c to 2.25c
Universal skelp, Pittsburgh	2.00c to 2.25c
Sheared skelp, Pittsburgh	2.00c to 2.25c

Shapes, Plates and Bars

Structural shapes, Pittsburgh	2.00c to 2.15c
Structural shapes, Phila.	2.275c to 2.425c
Structural shapes, New York	2.29c to 2.44c
Structural shapes, Chicago	2.10c to 2.25c
Tank plates, Pittsburgh	2.00c to 2.25c
Tank plates, Philadelphia	2.275c to 2.575c
Tank plates, New York	2.29c to 2.59c
Tank plates, Chicago	2.10c to 2.30c
Bars, soft steel, Pittsburgh	1.90c to 2.15c
Bars, soft steel, Philadelphia	2.225c to 2.425c
Bars, soft steel, New York	2.24c to 2.44c
Bars, soft steel, Chicago	2.00c to 2.25c
Bars, forging, Pittsburgh	2.60c to 2.75c
Bars, rail steel, Chicago	2.00c
Reinforcing bars, Pittsburgh	1.90c to 2.15c
Bar iron, common, Phila.	2.325c to 2.375c
Bar iron, common, New York	2.34c to 2.39c
Bar iron, common, Chicago	2.50c

Hoops, Bands, Shafting

Hoops, Pittsburgh	2.90c to 3.25c
Bands, Pittsburgh	2.90c to 3.25c
Cotton ties, per bundle Pitts.	$1.14
Cold finished steel bars, Pittsburgh base	2.50c to 2.75c

Rails, Track Material

Standard bessemer rails, mill	$43.00
Standard open hearth rails, mill	43.00
Relaying rails, St. Louis	28.00 to 35.00
Relaying rails, Pittsburgh	28.00 to 32.00
Light rails, 25 to 45, mill	2.15c
Angle bars, Chicago base	2.75c
Spikes, railroad, Pittsburgh	2.75c to 3.00c
Spikes, small and boat	3.50c to 3.75c
Spikes, railroad, Chicago	2.85c to 3.00c
Track bolts, Pittsburgh	3.85c to 4.50c
Track bolts, Chicago	3.85c to 4.00c
Tie plates, Pittsburgh	2.25c to 2.35c
Tie plates, Chicago	2.35c

Wire Products

100 lbs. to Jobbers in Carloads

Wire nails, Pittsburgh	2.70c
Plain and annealed wire, Pitts.	2.45c
Galvanized wire, Pittsburgh	2.95c
Barbed wire, painted, Pitts.	2.85c
Barbed wire, galv., Pittsburgh	3.35c
Polished staples, Pittsburgh	2.85c
Galvanized staples, Pittsburgh	3.35c
Coated nails, count keg, Pitts.	2.20c
Woven wire fencing (retailers)	68 off
Woven wire fencing (jobbers)	70½ off

Chain, Piling, Strip Steel

Chain, 1-in. proof coil, Pitts.	6.00c
Sheet piling base, Pittsburgh	2.05c to 2.30c
Hot rolled strip steel, Pittsburgh stamping quality	2.90c to 3.25c
Cold rolled strip steel, hard coils, 1½ inches and wider by 0.100-inch and heavier, base	4.50c

Sheets*

SHEET MILL BLACK

No. 28, open-hearth, Pittsburgh	3.35c to 3.50c
No. 28, bessemer, Pittsburgh	3.35c to 3.50c
No. 28, open-hearth, Phila.	3.675c to 3.825c
No. 28, open-hearth, Chicago	3.64c to 3.69c

TIN MILL BLACK

No. 28, open-hearth, Pittsburgh	3.35c to 3.50c
No. 28, open-hearth, Chicago	3.69c

GALVANIZED

No. 28, open-hearth, Pittsburgh	4.35c to 4.40c
No. 28, bessemer, Pittsburgh	4.35c to 4.40c
No. 28, open-hearth, Phila.	4.675c to 4.825c
No. 28, open-hearth, Chicago	4.64c to 4.69c

BLUE ANNEALED

No. 10, open-hearth, Pittsburgh	2.50c to 2.85c
No. 10, bessemer, Pittsburgh	2.50c to 2.85c
No. 10, open-hearth, Phila.	2.825c to 3.075c
No. 10, open-hearth, Chicago	2.84c to 2.89c

*Lowest prices represent American Sheet & Tin Plate Co. schedule.

Tin Plate

Per 100 lb. box.

Tin plate, coke base, Pitts.	$4.75

Iron and Steel Pipe

Base Discounts Pittsburgh to Jobbers in Carloads

	Black	Galv.
1 to 3-inch, butt steel	66	54½
1 to 1½-inch, butt iron	34	19

Boiler Tubes

Carload Discount 4 Points Larger

Steel, 3¼ to 13 inches, l. c.	48 off
Charcoal iron, 3¼ to 4½ inches l. c. l.	16 off
Seamless, hot rolled, 3¼ to 4-in., l. c. l.	45 off

Cast Iron Water Pipe

Class B Pipe

Four-inch, Chicago	$55.20 to 56.00
Six-inch and over, Chicago	51.20 to 52.20
Four-inch, New York	60.30
Six-inch and over, New York	55.30
Four-inch, Birmingham	47.50 to 48.00
Six-inch and over, Birmingham	43.00 to 43.50
Three-inch, Birmingham	56.50 to 57.00

Class A pipe is $4 higher than Class B. Standard fittings, Birmingham, base, $110.00 6 to 24-inch, base; over 24-inch, plus $20; 4-inch, plus $20; 3-inch, plus $20; gas pipe fittings, $5 higher.

Prices Present and Past

Representative market figures yesterday, and for last month, three months ago and one year ago

	Nov. 1, 1922	Oct. 1922	Aug. 1922	Nov. 1921
PIG IRON				
Bessemer, valley, del., Pittsburgh.	$34.77	$35.12	$29.16	$21.96
Basic valley, del., Pittsburgh....	31.77	32.37	27.96	20.96
*No. 2 foundry, del., Pittsburgh..	31.77	33.62	32.76	22.81
*No. 2 foundry, Chicago.....	31.00	31.75	28.60	21.00
Lake Superior charcoal, Chicago.	36.15	36.15	33.75	32.25
Malleable, valley	30.00	34.62	28.60	20.00
Malleable, Chicago	31.00	31.75	28.60	21.00
*Southern No. 2, Birmingham...	27.00	27.40	20.70	18.25
*Southern Ohio, No. 2 Ironton..	31.00	32.40	27.00	20.50
Basic eastern del., eastern Pa....	28.50	30.25	29.50	20.90
**No. 2X, Virginia furnace.....	33.00	33.00	26.00	22.80
**No. 2X, eastern del. Phila.....	31.13	33.00	32.15	22.50
Gray forge val. del., Pittsburgh..	31.77	33.27	30.16	21.96
Ferromanganese, del., Pittsburgh.	105.89	105.47	72.29	60.00
SEMIFINISHED MATERIAL—				
Sheet bars, bessemer, Pittsburgh..	40.00	39.85	35.00	30.00
Sheet bars, open-hearth, Pittsburgh	40.00	39.85	35.00	30.00
Billets, bessemer, Pittsburgh.....	40.00	40.00	35.00	29.00
Billets, open-hearth, Pittsburgh...	40.00	40.00	35.00	29.00
FINISHED MATERIAL—				
Steel bars, Pittsburgh	2.00	2.00	1.80	1.55
Steel bars, Chicago	2.00	2.00	1.88	1.68
Steel bars, Philadelphia	2.325	2.325	2.275	1.90

	Nov. 1, 1922	Oct. 1922	Aug. 1922	Nov. 1921
FINISHED MATERIAL Continued				
Iron bars, Philadelphia	$2.325	$2.325	$2.125	$1.90
Iron bars, Chicago mills.....	2.50	2.50	1.98	1.70
Beams, Pittsburgh	2.00	2.00	1.80	1.60
Beams, Philadelphia	2.325	2.325	2.325	1.90
Beams, Chicago	2.10	2.10	1.90	1.68
Tank plates, Pittsburgh.....	2.00	2.05	1.80	1.55
Tank plates, Philadelphia	2.325	2.425	2.325	1.90
Tank plates, Chicago.....	2.10	2.10	1.90	1.68
Sheets, blk., No. 28, Pittsburgh..	3.35	3.50	3.25	2.95
Sheets, blue anl., No. 10, Pitts..	2.60	2.60	2.45	2.40
Sheets, galv., No. 28, Pittsburgh	4.35	4.50	4.25	3.95
Wire nails, Pittsburgh	2.70	2.70	2.40	2.90
COKE—				
Connellsville furnace, ovens.....	8.00	10.60	13.20	3.15
Connellsville foundry, ovens.....	9.50	12.10	14.30	4.30
OLD MATERIAL—				
Heavy melting steel, Pittsburgh..	20.50	21.35	17.10	14.25
Heavy melting steel, east. Pa...	17.50	18.00	15.25	12.60
Heavy melting steel, Chicago...	18.00	18.50	15.80	12.40
No. 1 wrought, eastern Pa.....	22.50	22.50	18.25	16.50
No. 1 wrought, Chicago.....	19.50	20.40	16.35	13.70
Rails for rolling, Chicago.....	20.50	20.50	16.75	13.90

*1.75 to 2.25 silicon **2.25 to 2.75 silicon

Softness Still Marks Pig Iron

Eastern Pennsylvania Basic Sells $2 to $2.50 Lower and Other Districts Show Continued Easiness—Shipments Increase and Piling of Iron Is Reduced—Buying Is Kept to Early Requirements

Philadelphia, Oct. 31.—The outstanding pig iron business here chiefly is in basic of which a large tonnage in the aggregate was sold in the past few days at $28.50 to $29 delivered eastern Pennsylvania, a decline of $2 to $2.50. Foundry iron is 50 cents to $1 lower. Sales of eastern Pennsylvania foundry iron the past week were at $29 to $30 furnace for No. 2 plain (1.75 to 2.25 silicon) plus $1 for the silicon differentials. Pig iron statistically is somewhat easier. Large consumers report better deliveries on orders. So far practically no iron has been sold for first quarter, though some inquiry is out, aggregating about 2000 tons. Foreign iron is freely obtainable. Prices average $27 to $28 duty paid for English and continental grades equivalent to domestic No. 2 plain and No. 2X (2.25 to 2.75 silicon) for both spot and nearby and $29.50 to $30.50 duty paid, for Scotch, equivalent to No. 2X and No. 1X (2.75 to 3.25 silicon) for both spot and nearby. In some cases lower prices can be done. English low phosphorus is quoted at $28 to $29 c.i.f. or $28.75 to $29.75 duty paid. The outside figure applies when analysis is guaranteed. The Virginia market is quoted at $32 furnace plus $1 differentials for silicon. Due to prices, sales in that district are small.

Prompt Lots Are Wanted

Chicago, Oct. 31.—Except for prompt tonnages, the pig iron market is inactive. Buyers are continuing to hold off, although in need of further supplies as indicated by eagerness for spot carloads. There was a fair aggregate of sales in the past week. Small inquiry is noted for the first quarter but sales are negligible. Orders for first quarter are going at $31, the same as for prompt material. Weakness of prices quoted by eastern makers is reflected here, and $31 continues to be the base price for all grades. The Thomas furnace at Milwaukee has resumed production after banking.

Sales of foreign low phosphorus iron have been made into Chicago, 100 tons going recently at $38, delivered, as compared with the domestic price of $42, delivered. A Chicago machinery manufacturer is asking for 300 tons of foundry for November; a maker of heating apparatus for 1000 tons of foundry for its western plants; and a railway supply manufacturer for 500 tons of foundry for western plants. Included among current sales is 1000 tons of malleable to a Wisconsin shop; 100 tons of foundry to a Milwaukee user, 300 tons of foundry and malleable, to an agricultural implement maker, and 200 tons of foundry to an Illinois stove plant. A railway supply maker is seeking 150 tons of silveries. Southern iron is difficult to sell here and is quoted at $27 to $28, Birmingham, although one maker will accept $26.50 for prompt iron. Charcoal iron demand is small.

Consumers Marking Time

Pittsburgh, Oct. 31.—It has become apparent the past week that pig iron consumers are marking time. This is thought to be a natural reaction following the confused condition recently prevailing in the market. Buying has been for quick necessities alone, 50 or 100 tons chiefly. New inquiries for iron of all grades are at a low ebb, none involving large tonnages being current. A few users have inquired for first quarter 1923 iron and in the

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case of several located in the Mahoning valley, small lots involving 200 to 500 tons of No. 2 foundry iron, have been booked. The No. 2 grade (1.75 to 2.25 silicon) still is quoted at $30 to $31 although some small lots have brought $31.50 and $32 recently. Tonnage probably could be closed at $30. Malleable is considered quotable upon the same basis as No. 2 and gray forge at around $30 valley. No transactions are noted in connection with either grade. In connection with steelmaking iron, basic and bessemer, the same general condition applies. One producing interest closed on five or six carloads of basic at $30 valley to apply upon one of his contracts. A valley merchant interest sold several thousand tons at this figure. A few 50 or 100-ton lot orders for bessemer have been booked at $33 valley. This quotation is untested. Low phosphorus, copper-free iron remains quotable at $37 to $38 with only small lots involved in either sales or inquiries. The car supply is improving somewhat so that deliveries are heavier. As soon as cars become available the shippers make every effort to regain lost ground by shipping as much as possible on their contracts. Iron stocks at blast furnaces, therefore, are not large. Some operators have no iron at all on hand, shipments recently having been brought abreast of or slightly in excess of output.

Eastern Stocks Are Low

Boston, Oct. 31.—Stocks of pig iron in the East, both in the hands of consumers and producers, are unusually low according to recent reports. Furnaces seem reluctant to go into blast or even to secure backlogs at the present price level; consumers are equally reluctant to take on any tonnage which is not required to cover existing orders. In New England there is a small tonnage of southern iron, probably 3000 tons, in storage at Providence available for immediate shipment, and although this easily could be absorbed by a single large manufacturer, it is nevertheless sufficient to relieve anxiety concerning embargoes and delayed shipments from furnaces. Buffalo furnaces have been embargoed for shipment to New England over roads other than the Grand Trunk and other embargoes are rumored for the Pennsylvania and Delaware & Hudson and the New York, New Haven and Hartford, railroads. Prices of domestic iron are somewhat softer in nearly all districts. Buffalo iron is obtainable at $30 furnace for the base grade with from 50 cents to $1 premium for No. 2X (2.25 to 2.75 silicon.) Higher silicon iron is offered at varying prices apparently depending upon conditions in each individual sale. Eastern Pennsylvania iron has sold at $31 furnace for No. 2X or $34.65 delivered New England. Relatively small tonnage at this figure has been sold, however. Alabama iron is offered at $27 Birmingham, which by rail to New England means $36.61 delivered. The rail and water rate brings the iron into closer competition with the northern grades for points near Boston. Foreign iron prices show little change. Good grades of Scotch iron are difficult to obtain below $30 c.i.f. Boston, and some sales

Extended Statistics of American Iron and Steel Production and Ingot and Casting Output, page 1240

at $32 were reported during the week. Inquiry in New England shows improvement, but actual sales have been few and of small tonnage. A textile machine interest is in the market for approximately 1000 tons of 1.75 to 2.25 silicon and another 1000 tons of 5 to 6 per cent silicon iron. A Massachusetts tank manufacturer is in the market for 1000 tons, and several Connecticut manufacturers are asking for lots of from 200 to 500 tons.

Little Volume To Market

New York, Oct. 31.—Business in pig iron continues to lack volume in this district. New inquiry, although slightly larger, is not sufficient to indicate any material increase in business. Prices are easy but the market is not being subjected to any real test under present conditions. The $30 base minimum on eastern iron of a week ago has been shaded during the past week but only in exceptional cases and the market generally is regarded as $30 eastern Pennsylvania and New Jersey furnaces, plus $1 silicon differentials Buffalo foundry has been sold by first hands during the past few days at $29 to $30 base Buffalo, plus $1 silicon differentials. Prices on foreign iron are unchanged. Foreign iron on hand is more plentiful and some importers now are able to offer quite regularly for shipment out of stock. Prices asked for stock iron in some cases are lower than on foreign iron for forward shipment, owing to the desire of the merchants to get rid of it. The market on English and continental iron, normal in phosphorus and sulphur, and substantially equivalent to our 1.75 to 2.25 and 2.25 to 2.75 silicon grades, varies from $27 to $28, duty paid, both for iron in stock here and for the same iron for November shipment from abroad. It is understood that such iron also in some cases has been sold lower. The market on Scotch foundry ranging from about 2.50 to 3 per cent silicon is quoted at around $29 to $29.50 duty paid New York, both for shipment out of stock and for forward delivery.

Buffalo Iron at $29.50 to $30

Buffalo, Oct. 31.—The going price of No. 2 plain (1.75-2.25 silicon) is $29.50 to $30, Buffalo furnace. Some furnaces are holding out for $1 differentials but they have been forced to take 50 cents. Inquiry reported by one maker is for 6000 tons of which 1000 tons resulted in sales. Some off iron, running up to 0.10 sulphur has been sold at $28. The inquiry is all for small tonnages. A 5000-ton inquiry for malleable reported last week has not been placed. Buying for the week has apparently been not more than 5000 tons altogether. Coke is freer but cars are still very slack.

Prices Continue Downward

Cleveland, Oct. 31.—The trend of pig iron prices continues downward, and keen competition is noted in the small tonnages moving. Makers are naming new low figures in an effort to attract business, admittedly without much success. While there are some exceptions, the price level this week is 50 cents to $1 lower than a week ago. A Cleveland producer reports small sales for outside delivery at $32, furnace, and at $33.50, furnace for delivery in Cleveland, remarking that these prices in some cases were rejected by the buyers a week previously, and indicating a stiffening tendency. At the same time another Cleveland furnace interest cut its price from $33 for Cleveland delivery to $31.50, and found few takers at this figure. Lower prices also are being done in nearby territory, and $30 is encountered in competition, east and west, while $30 to $31 is being done in the valley, and $31 is the price quoted, base Ironton. A conspicuous sale to a Columbus, O., consumer is that of 500 tons of malleable made by a lake furnace interest in the week at $29.50, furnace, equivalent to $31.39, delivered. The buyer subsequently has offered to take 500 tons additional at $31, delivered. Several small lots were sold by one of the northern Ohio group on a basis of $30, valley. One lot of 300 tons was sold to a consumer in the western part of this state at a reported price of $30 lake furnace. Five hundred tons of high silicon iron (2.75 to 3.25) was purchased by a Mansfield interest; a half dozen makers bid for this business and the figure actually done has not been disclosed. One of the lake furnaces closed in the week for an aggregate of several thousand tons, including 1000-ton lots for nearby delivery; other interests report a very dull market. There is little new inquiry.

No additional sales of basic have been made by lake furnaces in the week. Several thousand tons are reported to have been sold at $30, valley, by a merchant producer for delivery over the remainder of the year, the seller previously refusing $29. Jackson county makers have cut their prices of silvery iron and bessemer ferrosilicon $2 on all grades.

Market Shows Easiness

Cincinnati, Oct. 30.—An implement manufacturing interest at Mansfield, O., has closed for 500 tons of northern No. 2 foundry for delivery over the remainder of the year, the business going to a valley furnace at a price said to be under the equivalent of $30 base, Ironton. The Louisville & Nashville railroad placed 500 tons of mixed grades with southern furnaces. Apart from these two transactions and the purchase of 1500 tons of Ohio silvery by a Michigan automobile manufacturer the market's activities have been confined to small lots. Even these have been few. There is practically no inquiry. The market tendency is toward easiness. To the extent that practically all southern furnaces now are quoting a uniform flat price of $27, Birmingham base, against a spread from $27 to $30 a week ago the market is softer. The southern Ohio market is feeling the effect of valley competition, which shows an inclination to cut prices. While furnaces generally are quoting $31, Ironton base, recent sales of record have ranged from $30 up to $31.50. The Marting Iron & Steel Co. has announced that its Blanche furnace at Ironton will be blown in the latter part of this week. A cut of $2 in Ohio silveries has been announced to a basis of $39.50 Jackson county furnace for 8 per cent; $41.50 for 9 per

cent; $43.50 for 10 per cent; $46.80 for 11 per cent; and $50.10 for 12 per cent.

Buyers Still Waiting; Trend Easier

St. Louis, Oct. 30.—Users of pig iron in this district continue to wait, and sales are extremely light and almost entirely for prompt shipment. It is indicated that heavy future business is not likely to be placed at this time. The better movement of coal and easier coke situation are favorable to melters who see no reason why they should purchase iron at current quotations.

Leading consumers are fairly well covered. Shipments on contracts are considerably better than a few weeks ago. There has been distinct improvement in the movement from the South, and northern iron is arriving in larger tonnages. While no additional reductions have occurred, the tone of the market is distinctly easier, and it is well known that business can be done well under the base figures quoted in Chicago and Birmingham. Southern iron can be had as low as $27, and the sale of a small tonnage of northern iron is reported at $30, Chicago. Every plant in this district is anxious to get the iron due on contract. One inquiry from a central Illinois melter for 1000 tons insists on definite information relative to cars, the iron being wanted without delay. The melt in this district continues on a very large scale, a number of the most important consumers operating at full capacity. Car builders and stove foundries are particularly active. One leading stove manufacturer reports more business booked than at any time in eight years. The St. Louis Coke & Chemical Co. reports the sale of 1500 tons of low silicon foundry iron to a western melter and 1000 tons of the same grade to an East Side interest. This producer also sold small lots aggregating about 600 tons. Other sales heard of total approximately 900 tons. The transportation situation is improving slightly.

Market in South Still Strong

Birmingham, Ala., Oct. 30.—The pig iron market in the South is still strong, despite reports from other centers as to recessions in quotations. A little deflection is noted in prices today compared with two weeks ago, the prevailing level being $27.50 to $28.50 for No. 2 foundry. A few sales have been made for delivery during the first quarter of next year, but the price is not stated. Books are being opened for 1923 business and it is expected considerable tonnage will soon be sold. Production is being maintained. A little better service is noted from the railroads but there is yet much complaint.

The melt of pig iron in the South continues steady, despite the fact the pipe market is about at the end of the season. Local consumers have not been in the iron market recently for any important tonnage. The Woodward Iron Co. is ready to blow in its furnace at Woodward which has been repaired. Progress is reported on the repairing of a blast furnace at Ensley and one at Gadsden. The Sloss-Sheffield Steel & Iron Co. is pushing the work of repairing the North Birmingham furnace which was blown out recently.

Coke Offerings Increase

Furnace Companies Now Asked To Name Prices They Will Pay—Standard 48-Hour Connellsville Fuel $8 to $8.50

COKE PRICES, PAGE 1166

Pittsburgh, Oct. 31.—Additional coke ovens getting into production have changed the aspect of the situation in this district. Blast furnace operators who a few weeks ago were searching for small amounts of 48-hour fuel have been approached this week with requests that they make offers upon various sized tonnages available. Several furnace operators have been inquiring for November requirements and a few have closed. Among the latter is the Shenango Furnace Co. The Trumbull-Cliffs Furnace Co. also is understood to have closed upon its November requirements of about 18,000 tons. While M. A. Hanna & Co. again purchased a small lot in the open market in the past week it is understood that its regular source of supply now is able to produce sufficient coke for its requirements, having additional ovens in operation. Strictly standard coke for short delivery was sold in the week at $8.50 and for November and December has been quoted at $8.25 ovens. While there have been some sales of medium or high sulphur coke at $7.50 or $7 and a few at even a less figure, the market on standard 48-hour Connellsville fuel is fairly firm at $8 to $8.50, ovens. This was the range of prices paid in some of the transactions referred to. Various consumers, however, still have hopes that the market will go lower and are waiting. In foundry coke, $9.50 to $10 represents the regular market level, some recession having been recorded since a week ago. Some of the better known brands of 72-hour fuel have brought $10 the past week, although as high as $11 is quoted on a few brands which usually carry premium figures. Single carloads chiefly are ordered, although two to five cars at times are bought. The car shortage is less acute than for several weeks, although in certain directions it still is serious. Production according to the *Connellsville Courier* for the week ended Oct. 21 was 146,720 tons as compared with 140,710 tons the week before.

Furnace Coke Offered at $7.50

Philadelphia, Oct. 31.—Coke prices are easier, standard foundry fuel being $10 to $11, Connellsville, and furnace coke $7.50. It is expected one furnace will close a contract for November tonnage at this price.

Deliveries Better, Prices Lower

St. Louis, Oct. 30.—General demand for coke continues excellent, but the situation is less tense owing to larger receipts of coke and coal and a slight easing in the transportation service. Connellsville 72-hour foundry coke has declined, the range being from $12 to $14, the $15 figure having disappeared. Southern coke is being offered on advantageous terms, and fair tonnages have been purchased and used by melters in this territory. Prices of local by-product coke have not been affected. The leading east-side producer is operating virtually at capacity, producing close to 1500 tons daily. Generally the coal situation is much more satisfactory from the consumer's viewpoint. Tonnages are moving better, and prices are decidedly lower. The demand for steam coal is quiet, and retailers are well supplied.

October Sales Lage

Boston, Oct. 31.—Coke sales during October were unusually heavy in New England. The Providence Gas Co. is understood to be sold up for its first half foundry capacity, and to have withdrawn from the market. The New England Coal & Coke Co. also is well sold, and is contemplating closing its books in the near future. Sales of the last two weeks are estimated to have exceeded 100,000 tons. The current delivered price on contract continues to be $16.50 per ton. Connellsville foundry coke is offered as low as $10, Connellsville, which makes it low in the market, yet few sales are reported. Demand for spot shipment has eased off.

Market More Active

New York, Oct. 31.—Consumers who have been refraining from buying ahead are coming into the market for their November requirements of foundry coke. Some are in the market for part of their December requirements. The market reflects more activity than for some time past, prices show a wide range, depending upon the brand, but the general tendency continues sharply downward. The current range of prices on foundry coke is $10 to $12, Connellsville. The Seaboard By-Products Coke Co. today announced a price of $12.91 for by-product foundry coke, delivered at Newark.

Deliveries Better, Prices Easier

Cincinnati, Oct. 31.—Coke deliveries are meeting with minimum interference with the result that there is a heavy movement from the ovens, and the market is easy. Practically all ovens are being liberally supplied with cars and producers are well caught up with deliveries. There is but little spot buying, however, and inquiry is light. A number of Ohio blast furnaces have closed contracts during the past fortnight which in some instances will meet requirements for many weeks. These contracts are reported at a range of $8 to $9.50. The output of the Ashland by-product ovens is said to have been contracted by three furnaces on a basis of $11, Connellsville. The Indianapolis base price will not be changed for November.

Southern Foundry $8.50

Birmingham, Ala., Oct. 30.—No weakening is noted in the coke market in the South, the only difficulty being a shortage of cars and inability to ship as promptly and in quantity desired. By-product foundry coke is $8.50 for contract and as high as $10 for spot shipment in carload lots. Production is on a steady basis. Independent companies report their shipments about equal to their production. Considerable coke is still being shipped to the Southwest.

Bar Demand Still Large

Orders from the Implement Makers Improve and Automotive Requests Show no Letdown—Specifications Are Heavy

BAR PRICES, PAGE 1166

Chicago, Oct. 31.—Selling of soft steel bars continues in large volume and both orders and specifications coming to an important producer during the past week have made this period one of the best in several months. Some improvement is shown in demand from agricultural implement makers. Producers of bolts and rivets are in need of raw material, which mills cannot supply to meet their requirements. Demand from the automotive industries is not falling off at this season, for the first time in the history of the industry. For nine months of this year 925,325 Ford cars have been turned out and the year's production by this maker will be 1,300,000 cars. Some inquiry for contracts for next year has been made, but has not resulted in bookings. The Illinois Steel Co. is taking nothing but orders and is not booking contracts, except for rails or for structurals to be used in definite projects. Inland Steel Co. has not yet opened its books for first quarter and because of its heavy bookings of rails, track fastenings and heavy structurals will not have a heavy tonnage to offer its customers when it resumes selling.

Producers of bar iron still face an unsatisfactory condition with one mill idle and another devoting most of its time to rerolling steel. In spite of the unsatisfactory demand, the price remains steady at 2.50c, Chicago mill. Rail steel bars are in good demand at 2.00c, mill, all classes of users being in the market. Agricultural implement producers are taking some of this material.

Demand Is Fair

Philadelphia, Oct. 31.—Steel bar demand continues fair, but is confined principally to spot business which mills find difficulty in filling. Most producers are sold up from 30 to 60 days. Usual prices being quoted on steel bars range from 2.00c to 2.15c, Pittsburgh. Forging bars generally are quoted 2.25c, Pittsburgh, and spring steel, 2.25c.

Delivery Fixes the Price

Cleveland, Oct. 31.—Only a limited volume of new business in steel bars is moving in this territory. The factor of delivery is regulating the price. A large Ohio industrial consumer this week paid 2.10c, Pittsburgh, for several hundred tons for early shipment. One lot of 50 tons for delivery within a week went at 2.25c. For delivery beyond 30 days or at mill convenience, 2.00c, Pittsburgh, is the common price although certain independents are still understood to be offering 1.95c in cases while the Carnegie Steel Co. is naming under 2.00c here and there.

Business Placed at 2.10c

Pittsburgh, Oct. 31.—While an occasional order for merchant steel bars involving a small tonnage for prompt delivery brings as high as 2.25c, a more representative range of quotations in the spot market would be 2.00c to 2.15c, base Pittsburgh. Some orders involving 100 or 200 tons at a time were placed recently at 2.10c, base Pittsburgh, although on deliveries deferred until late in January or early in February the buyer could order at around 2.00c. Orders for merchant steel bars continue more numerous than either plates or shapes and take in tonnages from 50 to 1000 tons at a time. One or two orders of slightly in excess of 1000 tons were placed within the past week.

Cold drawn bar producers still are calling for deliveries on contracts as are other consumers. They also are endeavoring to specify all remaining unfilled portions of their contracts. Various consuming lines are represented in new orders. In connection with refined iron, the situation largely is unchanged, with demands only slightly increased and prices the same as a week ago.

Demand Is Steady

Buffalo, Oct. 31.—Steady demand prevails for steel bars. The price of this material ranges from 2.00c to 2.15c, Pittsburgh. Reports of 1.95c in other districts apparently have no parallel here. Bar mills here are operating at 100 per cent of capacity.

Equipment Governs Output

Pittsburgh, Oct. 31.—Operations of cold-drawn steel bar plants are slightly better because the steel supply is improved. With a continued labor shortage, 60 per cent would be a representative average for this district's operations. Hot bar tonnage receipts in many cases are confined to the capacity of the transportation equipment furnished by the cold bar finishers themselves so that the quicker they can unload their own railroad cars or automobile trucks, the more steel they are able to receive. Prices are unchanged, the ruling market figure remaining at 2.50c, with 2.75c often obtained on small lots of the smaller sizes, particularly in hexagons. Cold-drawn bar producers are reluctant to commit themselves for the first quarter of next year and in view of the continued uncertainty of operations due to various causes they have confined their fourth quarter commitments to a minimum with some tonnage reservations made for regular customers. Recent orders have involved less-than-carload lots although for the most part carload orders are placed and occasionally 100 to 500 tons or more are booked at a time.

New Hoop Orders Small

HOOP PRICES, PAGE 1166

Pittsburgh, Oct. 31.—Continued open weather is favoring shippers of hoops and bands as well as other steel product makers. This is aiding hoop and band makers in their ambition to clear their order books within 60 days of accumulation. New business is being placed, but only in small lots, an occasional falling off in tonnage being noted. The market price continues unchanged at 2.90c although as high as 3.25c often is quoted and received upon the narrower sizes and thinner gages.

Rivet Makers Ask Higher Prices on Small Lots

NUT AND BOLT PRICES, PAGE 1234

Philadelphia, Oct. 31.—Eastern rivet-makers have advanced quotations on small lots, structural rivets now being quoted 3.15c, boiler 3.25c and small 65 off. However, on large orders the old prices are quoted, namely, 3.00c for structural, 3.10c for boiler and 65 and 5 off for small. Bolt and nut prices are unchanged. Specifications against contracts for the latter are fairly heavy. Pennsylvania railroad has placed a heavy tonnage of bolts for car repairs and the Philadelphia Rapid Transit Co. has recently completed ordering large quantities of bolts, tie rods, etc. The New York Shipbuilding Co. is expected to make at its own plant the rivets for the two Red D boats recently booked.

Specifications Fairly Numerous

Pittsburgh, Oct. 31.—Specifications on nuts, bolts and rivets vary in size and are numerous. Jobbers for the most part have well filled stocks. Most of the recent activity therefore, has originated with large users in various lines. Occasional orders for a carload or two at a time are noted with numerous less-than-carload lots and once in a while a fairly large tonnage will be taken by one buyer. Deliveries, hampered of late by transportation difficulties are improving. A wide range of quotations still is noted in connection with rivets. The general market is quotable at 3.10c to 3.15c Pittsburgh.

Market Is Unchanged

Cleveland, Oct. 31.—The market for bolts, nuts and rivets in this district is virtually unchanged from a week ago. Demand continues fair with no outstanding business being offered. Specifications against contracts continue to be received in fair volume. Producers are experiencing but little difficulty in shipping material from their plants but it is understood some trouble is experienced in obtaining raw material supplies. Prices are firm at the established levels and no shading is reported.

Producers Well Booked

Chicago, Oct. 31.—Little change is taking place in the market for bolts and nuts, producers being well booked for fourth quarter and plant operations being as full as the supply of raw material will allow. Prices are held.

Freight Loadings Go Over 1,000,000 Cars

Freight loadings in the week ended Oct. 21 exceeded 1,000,000 cars for the first time since October, 1920. Loadings totaled 1,003,759, an increase of 20,000 in the week. The outlook is that loadings in the week ended

Oct. 28 will set a new high record. It is rumored the interstate commerce commission is planning shortly to modify its service order reserving for the coke trade cars with sides above 42 inches but confirmation is lacking.

More Iron Ore Sold in Small Lots

ORE PRICES, PAGE 1234

Cleveland, Oct 31.—Small lots of iron ore, 5000 to 15,000 tons, continue to be sold by the Lake Superior shippers, and the aggregate of these in the last two weeks is over 100,000 tons. Some of the inquiries for 25,000 to 35,000-ton lots in the market recently have not been closed. Not much tonnage in addition to that already contracted for can be shipped, owing to the transportation situation. The grain movement is heavy and the freight rate is at least 100 per cent greater than that on ore. Scarcity of vessel tonnage, however, is due principally to delay in unloading grain at Buffalo, as a consequence of car shortage.

The Lake Superior Iron Ore association gives the following data relating to tonnages of ore consumed by furnaces and amounts on hand:

	Tons
Ore consumed in August	2,589,251
Ore consumed in September	2,989,545
Ore consumed in September, 1921	1,430,775
Ore on hand at furnaces Oct. 1, 1922	32,776,722
Ore on Lake Erie docks Oct. 1, 1922	9,028,708
Total on hand at furnaces and Lake Erie docks Oct. 1, 1922	41,805,430
Total on hand at furnaces and Lake Erie docks Oct. 1, 1921	37,746,943

Ore shippers at a meeting Monday decided to file a bill of exceptions in the Lake Superior ore rate case, taking exception to all the rates as recommended by the examiner for the interstate commerce commission. The reductions recommended in the old range rates are claimed to be insufficient.

Strip Production Gains

STRIP PRICES, PAGE 1166

Pittsburgh, Oct. 31.—Specifications applying upon strip steel contracts are coming in and new orders are fairly numerous. As ability to deliver improves owing to a better car supply, removal of embargoes, etc., strip steel mill operations are mounting. In one or two cases 80 per cent has been attained this past week, as compared with 50 per cent two or three weeks ago and there is every indication that the 80 per cent level will be sustained for some time unless other transportation difficulties develop. Present strip demand is evenly divided between hot and cold-rolled. Tonnage requests come from a diversified line of consumers and all are furnishing attractive rollings, 100 to 500 tons at a time, with a large number of small orders and one or two involving 1000 tons or so. Prices are unchanged at 2.90c and 4.50c, base Pittsburgh, on hot and cold-rolled strips, respectively.

The Jenkinson Machine & Tool Co., Providence, R. I., has been adjudicated bankrupt, following a creditors' petition filed against it. The creditors elected a trustee recently.

Car Plates Lead Demand

Heavy Tonnages Needed for Equipment Now on Inquiry—General Buying Quieter—More Eagerness by Mills for Tonnage

PLATE PRICES, PAGE 1166

Chicago, Oct. 31.—Demand for steel plates promises to be active for several months as inquiries for many freight cars continue before the market. In addition to this business, which is fairly definite, considerable oil storage tank inquiry is being negotiated, under cover, which will add to steel plate requirements. For cars now actively on inquiry, a total of about 450,000 tons of steel will be required, of which the larger portion will be plates. Should an additional inquiry for 30,000 cars come out, as expected, 300,000 tons more of steel will be needed. Inland Steel Co., which has had a small tonnage of sheared plates for December delivery, is now practically sold to the end of the year. Its price has been 2.30c, Chicago mill. A valley mill has sold moderate tonnages of plates for delivery in Chicago late in November at 2.25c, Pittsburgh, and it is understood other plates for later delivery have been obtained from eastern mill at 2.00c, Pittsburgh. The leading producer at Chicago continues to quote 2.10c, Chicago mill, and is booking for indefinite delivery on that basis.

Tank Inquiries Fall Off

Pittsburgh, Oct. 31.—This past week appears to have been the "off" week in tank inquiries, none of size being circulated. It now is stated here that the Sinclair Oil Co.'s inquiry for 10 tanks was withdrawn. The only tank inquiries now before the trade involve one or two tanks, each calling for between 200 and 500 tons of plates. A few boiler shop inquiries for plates are current, as are one or two requests for bids on river barges. The latest of these involves three barges for the United States Engineers' office, Pittsburgh. About 1500 tons of plates are involved and bids will be taken until Nov. 25. Plates are quoted all the way up to 2.25c although the majority of specifications furnished carry figures nearer the 2.00c, base Pittsburgh, minimum. New business brings 2.10c, 2.15c and 2.25c, depending upon the tonnage involved and the delivery.

More Eager for Tonnage

Philadelphia, Oct. 31.—Plate demand here is smaller and due to increasing ability of the mills to produce, they are eager for tonnage. Nevertheless, high costs are checking price competition. On occasional attractive tonnages, 1.95c, Pittsburgh, has been done especially on plates in combination with shapes but usually 2.00c is the minimum. Attractive or smaller lots are bringing 2.10c to 2.25c. Further locomotive plate business is in the market. The Pennsylvania railroad has made no decision yet respecting 2000 to 5000 tons of plates for the first quarter. Shipyards here are asking for protection on about 500 tons of steel for seven barges, five for the New York Central railroad and two for another interest. The New York Shipbuilding Corp. is inquiring for boiler steel for two Red D boats. The Reading railroad will build five heavy locomotives in its own shops at Reading. The Illinois Central has placed 85 locomotives with the Lima Locomotive Works and the Main Central railroad has placed 12 locomotives with the Lima works. Some locomotives placed recently are for delivery as far ahead as next fall.

Buyers Postpone Action

New York, Oct. 31.—Plate demand is quiet in this district. Action on several good projects recently pending has been postponed. The Sinclair oil interests have postponed action on an inquiry for ten 80,000-barrel tanks involving 3000 tons of plates. It is expected, however, that inquiries for oil tanks which were withdrawn some time ago, will be revived shortly. Current prices on plates range from 2.00c to 2.25c, base Pittsburgh, although in some instances 1.95c has been done on sheared plates. The New York Central railroad has rejected bids which it recently received on five steel barges and will open new bids next week. The Bartlett-Hayward Co., New York, has taken the contract for building a gas holder at Syracuse, involving 2500 tons of steel.

New Tonnage Is Light

Cleveland, Oct. 31.—New business in steel plates has dropped off in the Cleveland district. The shipyards, boiler makers and other plate consumers have not much new work in prospect although several smaller type boats which have been before lake yards still are unclosed. Some boiler manufacturers have been inquiring for steel for delivery after Jan. 1 but this is the exception. The Lima Locomotive Works has placed about 300 tons for eight locomotives for the Main Central. An inquiry for 20 additional oil stills requiring from 600 to 700 tons is current. Prices are about stationary at their recent levels or around 2.00c, Pittsburgh, for tank steel with the Steel corporation mills quoting under that figure on occasion for extended delivery. Boiler steel is firm at 2.25c, Pittsburgh.

Fuel Shortage Threatens To Reduce Operations

Chicago, Oct. 31.—With an additional blast furnace blown in at South Works, giving 16 active stacks out of 27, the Illinois Steel Co. has increased its ingot production to 73 per cent of capacity for the present week. Inland Steel Co. continues at 65 to 70 per cent of capacity, but the fuel situation is such that it is not certain to be able to continue all three of its blast furnace stacks in production. The fuel supply under present fine weather conditions is so little in excess of current needs that fears are expressed for the supply which may be available during winter weather. Steel producers here expect some banking of furnaces.

Scrap Weakness General

Price Reductions Reported in Nearly All Market Centers—Tranportation Tie-ups Hamper Shipments—One Sale Aggregates 50,000 Tons

SCRAP PRICES, PAGE 1238

Chicago, Oct. 31.—Declines of about 50 cents per ton have taken place in scrap as a result of lessened buying. Consumers appear to have covered for the present and are remaining out of the market. A considerable short tonnage remains and brokers are buying to cover this. Steel consumers and rolling mills are taking practically nothing, but foundries are buying cast scrap from hand to mouth in small quantities. Rails for rolling are quiet, as mills using this material bought fairly heavily several weeks ago and have a surplus. Railroad offerings are still much below normal and few lists are offered. The Chicago, Burlington & Quincy offers 3100 tons and George W. Jenings 1700 tons.

Prices Decline Further

Boston, Oct. 31.—Following a continuance of low demand, scrap prices have fallen off slightly during the past week. Heavy melting steel has dropped to $13.50, shipping point, and No. 1 cast has sold at $22, delivered, compared with $23 of about a week ago. Stove plate is reported by some dealers as a drug on the market, and sales at $16.50, delivered, are reported. Pipe has sold at $11, shipping point. Rails for rolling and borings are about the only two grades which are in demand and which have not weakened in price. An attractive tonnage of rails for rolling was sold recently at $16, shipping point, and chemical borings have sold in several cases at $17 and in one case at $17.50.

Only Large Sales Reported

Philadelphia, Oct. 31.—Despite the purchase of 50,000 tons of steel scrap by the Jones & Laughlin Steel Co. at $21 delivered, little scrap buying is done here. The market lacks support. Prices are moving down further, mainly in connection with unsold scrap shipped on consignment on which the smaller dealers were forced to take a reduction. Steel and iron mills are telling dealers that due to decreased sales of finished materials they are not interested in scrap.

Buys Shell Tonnage

Buffalo, Oct. 31.—The Pennsylvania Wood & Iron Co., Buffalo, has purchased 7038 gross tons of 8-inch shells from the government storage at Toledo, at $23.06, Toledo. This is the second purchase of this kind by the same company, the first purchase having been 3000 tons. Heavy melting steel is hard for mills to get at the price they want to pay. Tonnage is freely offered at $20 to $20.50, but mills want to buy for $19 to $19.50. Demand for malleable at $22 to $23 is good and the Canadian demand for cast continues. Shortage of cars is very seriously affecting shipment of old and high priced orders, which dealers are anxious to clean up.

Prices Generally Soften

St. Louis, Oct. 30.—The scrap market is softer, being due to the fact consumers are holding off apparently endeavoring to lower prices. Melters are rejecting cars more freely than usual. A further factor in the weakness has been a somewhat heavier movement of both railroad and dealers' scrap. The melt continues heavy, especially with the mills which have business booked in volume sufficient to keep them going for some time to come. Another busy department is stove foundries, which are enjoying the most prosperous times experienced in a number of years. To this is largely due the strong demand for cast scrap, prices on which have not been affected by the general downward trend. The largest railroad offering before the market was 3200 tons from the Pennsylvania, southwestern region. The Missouri, Kansas & Texas has a list of 900 tons.

Optimism Still Noted

Birmingham, Ala., Oct. 30.—Considerable scrap is still being brought to the yards for assortment and much is moving out but new contracts are not being placed as rapidly as a short time ago. Consumption of heavy melting steel is better now but the largest consumer in this territory maintains an offering price under that asked by the dealer and appears to be getting all the tonnage it requires. Quotations show little change for the week. There is plenty of stock in hand and any and all orders can be filled promptly, it is stated.

Reductions May Come

New York, Oct. 31.—Further weakness is noted on the local scrap market, although dealers' buying prices are showing little change. Reductions, however, are likely to develop at any time. The slowing up in demand is the principal contributing factor in this situation. This is particularly noticeable in cast scrap, in which there is now little interest. Trading in heavy melting steel has also slowed up considerably, the Bethlehem Steel Co. being the only buyer of importance, and demand for wrought pipe is sluggish. In this grade, there has been a reduction in price of about $1. The Alan Wood Iron & Steel Co. has stopped shipments of heavy melting steel against its recent orders. This, it is understood, is to be in effect about 10 days.

Slight Recessions Registered

Pittsburgh, Oct. 31.—Some slight recessions again have been registered in several grades of scrap, heavy melting steel being quoted at $20.50 to $21, as against $21 to $21.50 a week ago. Wrought No. 2 likewise is reduced 50 cents to the same basis and steel specialties have been lowered in like measure. Recent sales of rails for rolling have brought as high as $24 while the maximum of the market a week ago was $25. Stove plate likewise is down $1 per ton. Indications are plain that a large independent steel interest here, usually entering the market for 15,000 to 50,000 tons of scrap at a time, is preparing to entertain quotations on a large block of scrap. Miscellaneous orders coming from consumers this past week, however, have been for immediate needs and involve only small tonnages. It is expectod that the 50,000 tons or more involved in the several railroad lists issued by the Pennsylvania system will be bid in by dealers to cover shorts since yard stocks are so badly depleted. All of their customers are calling for deliveries on old contracts before entering into new arrangements. The Pennsylvania's list, on which bids will close Nov. 1, follows: Eastern region, 25,688 tons plus 5400 tons of rails; central region, 10,500 otns; southwestern region, 5200 tons; and northwestern region, 3380 tons in addition to which six locomotives are offered for bids involving 450 tons.

Prices Marked Down

Cleveland, Oct. 31.—New transactions in scrap in this district are few and the market is soft on certain grades although for the most part prices are fairly firm. Steel rails for rolling are down $1 a ton to $22 to $23 while small forge flashings are off $1.75 to $13 to $13.25 and large forge flashings have been reduced 75 cents to $12.75 to $13; No. 1 busheling is down from $14 to $14.25 to $12.75 to $13 and No. 2 busheling from $13 to $13.50 to $12 to $12.25. Valley prices are unchanged.

Prices Are Irregular

Cincinnati, Oct. 31.—The scrap market is spotty with considerable irregularity in prices but on the whole it is firm. Except for heavy buying of certain steel grades the market is inactive, but little scrap is being taken by foundry melters. Heavy melting steel is in active demand and is quoted at an advance of 50 cents a ton. Railroad wrought, iron car wheels, and No. 1 cast, are quoted at a like advance, railroad and agricultural malleable are 50 cents to $1 higher, and iron axles are selling at an advance of $1. Industrial production of machine shop turnings and cast iron borings is increasing so rapidly that these grades have declined fractionally.

Wire Rod

Inquries Feature Semifinished Market—Producers Heavily Obligated

SEMIFINISHED PRICES, PAGE 1166

Pittsburgh, Oct. 31.—Users of wire rods are furnishing the feature of this week's semifinished market, numerous inquiries being circulated. A number are circularizing the wire rod producers, in some cases endeavoring to tap sources of supply never before approached. Some of these inquiries involve tonnages up to 500 tons per month for November and December, and several in addition are asking for protection on supplies for the first quarter of next year. Great difficulty is being experienced in placing wire rod business, since practically all producers are well obligated or else they need all of their output. Last sales of wire rods recorded a few weeks ago were on the basis of $50, Pittsburgh, and about the same time other orders were taken at $47.50, Pittsburgh, but the American Steel & Wire Co.'s last price

of $45 has not been changed. It is doubted if any buyer can obtain prompt deliveries for less than $50. Apparently the large interest which purchased sheet bars and slabs last week has supplied its need for the time being. The only activity in sheet bars is noted in requests for prices on first quarter requirements by such users as the Standard Tin Plate Co., Canonsburg, Pa., and other nearby sheet and tin mills which have to depend upon outside sources for their supplies of sheet and tin bars. While a sale of sheet bars recently was consummated under $40, that appears to represent the minimum of the market today with practically all output for the last quarter obligated. No price announcements as yet have been circulated for the first quarter of 1923. No inquiries are noted this week for rerolling billets or slabs, and the market on these two products is unchanged at $40, Pittsburgh or Youngstown. Forging billets still are quoted at $45 to $50 with little or no interest manifested, users in this territory having covered their requirements for a month or two. Except for an occasional transaction in skelp, no activity is noted. From 2.00c to 2.25c, base Pittsburgh, still represents the quotable market.

Inquiring for Forging Billets

New York, Oct. 31.—The American Locomotive Co. is inquiring for 1100 tons of forging billets. Otherwise current inquiry is light. Some small tonnages of billets have been closed here during the past week, mainly forging quality, at $45 to $47.50, base Pittsburgh. Open-hearth rerolling billets are quoted at $40, base Pittsburgh. Wire rods continue at $47.50, base Pittsburgh, although the $45 price has not entirely disappeared. Some makers are sold up on wire rods to the end of the year.

New Sales Lacking

Youngstown, O., Oct. 31.—Sales of semifinished material are lacking this week, although during the past two weeks substantial tonnages of sheet bars were placed with certain valley producers at $40, Youngstown. This figure also represents the market on slabs and billets.

Sells Sheet Bars at $40

Cleveland, Oct. 31.—A somewhat more active demand for sheet bars is noted here, a leading maker having booked a round tonnage of this material, included in the last week's business amounting to 10,000 tons of sheet bars, billets and slabs, at $40, Youngstown. The greater part of the tonnage is for delivery in November, and this interest is not yet quoting for next quarter delivery. Some independent makers now are quoting wire rods at $50, Pittsburgh, and the minimum of the going market appears to be $47.50 since the Steel corporation's price of $45 is not available on new business.

Wire Rods Now $47.50

Philadelphia, Oct. 31.—The market for billets is quiet. Moderate lots have been sold at $40, Pittburgh, for rerolling quality and $45 for forging. Urgent pressure for wire rods continues, and while $45 has not entirely disappeared $47.50 is now the usual price. One maker after selling a tonnage at $50 has withdrawn for this year.

Weakness Noted in Sheets

Some Buyers Withhold Purchases When Black Are Offered at 3.35c—Market at Youngstown Is Quiet—Full Finished Strong

SHEET PRICES, PAGE 1166

Pittsburgh, Oct. 31.—Users of sheets continue to insist that orders on the books of makers be shipped out, and daily grow more eager in their efforts to have their tonnages increased so that they will be protected for the first quarter of next year. Books of the American Sheet & Tin Plate Co. have not been opened for that period but it is expected that this will be done within the next week or 10 days. The American company's figures continue unchanged at 2.50c, 3.35c, 4.35c and 4.70c, base Pittsburgh, respectively, on blue annealed, black, galvanized and full finished automobile sheets. Being filled up for the fourth quarter and with the necessity confronting it of carrying tonnage over to the first quarter of next year, the American company is endeavoring to postpone further bookings until it announces its next price schedule. Its operations have increased slightly and a further increase is scheduled for this week with every expectation that it will be realized. Last week's operations of hot mills approximated 60 per cent. Practically all grades of sheets are in favor, one or two independent producers finding themselves lacking in black sheet business although they have an abundance of galvanized sheet orders on their books. This is due perhaps to concentration upon the galvanized product in sales some time ago. While independents have quotations as high as 25, 30 and in one or two cases 35 cents per 100 pounds in advance of the leading interest's figures, the usual market on blue annealed is 2.60c, black 3.50c, galvanized 4.50c and full-finished automobile sheets 5.00c, base Pittsburgh. Shipments of sheets still are greatly interfered with by car shortages and while some sheet mills in this territory recently invested in additional railroad cars, this did not help much since so few were available. Car purchases were confined to those which have been on hand at a car builder's plant for some time past, it being impossible to wait for new ones to be constructed. Restrictions upon the use of certain cars likewise have hampered sheet shipments, as have labor shortages. It is expected that transportation difficulties of one kind or another will be the chief deterrent all through the winter. A feature of the sheet market is the continuance of activity of automobile manufacturers. Except in one or two cases, due purely to local conditions, there have been no holdups and in contrast to these, six or seven automobile manufacturers have asked for increased allotments.

Many Consumers Buying

New York, Oct. 31.—Specifications on sheet contracts continue good and a large number of consumers who did not close for the fourth quarter are placing orders. Prices are unchanged. Most business in blue annealed sheets is going at 2.75c, base Pittsburgh, although the 2.60c price has not entirely disappeared. On galvanized sheets the usual price is 4.50c, base Pittsburgh, and on black, 3.50c.

Market Is Quiet

Youngstown, O., Oct. 31.—While some sheet business is being placed with makers in this district, the volume has tapered off and the market is quiet. The present lull in sheet purchasing is due, according to one observer to the softening of prices quoted by certain independent producers. Where specifications are desired by these mills to round out their rolling schedules the quotation of 3.35c, Pittsburgh, on black sheets for two to three weeks delivery is encountered. While this figure has not been named generally by independent producers, consumers are aware of it and have delayed purchases. Some producers believe the situation is only temporary. Others are of the opinion that prices advanced too rapidly during the past six months and that it will take some time before consumers again order freely. Meanwhile the market here is quotable at 3.35c to 3.50c on black; 4.40c to 4.50c on galvanized, and 2.75c to 2.85c on blue annealed. The full strength of the sheet market is found in the fine finished grades although the demand is not as heavy as it was a few weeks ago. Producers, however, still are in a position to choose specifications. Considerable tonnage will be carried over into next year's rolling, according to some producers here. Automobile sheets are quotable at 5.00c, Pittsburgh, for No. 22, although autobody seconds are offered at considerably less.

Buy Some Eastern Sheets

Chicago, Oct. 31.—Although Chicago sheet mills are taking fairly good care of their customres in the matter of deliveries, they are unable to furnish as much as is desired and some buying is being done from mills in the valleys. One Youngstown interest sold some sheets into Chicago territory recently on the basis of 3.50c, Pittsburgh, for black and 4.50c for galvanized. These prices are $3 per ton higher than the nominal figures of Chicago mills. It appears practically impossible for further sheet buying to be done in the Chicago market for any delivery during this year.

Meet Corporation's Prices

Philadelphia, Oct. 31.—The market for sheets here is easier. Independents recently started to meet the Steel corporation's prices on occasional lots of black and galvanized for spot rolling, and are now booking attractive business at the prices. Some of the tonnage is for delivery in the next month or two. The current market on black sheets is 3.35c to 3.50c, Pittsburgh; galvanized, 4.35c to 4.50c. Blue annealed sheets are comparatively stronger, ranging from 2.60c to 2.75c, Pittsburgh, although 2.60c is now more frequent.

Structural Demand Less

Waning Season Reflected in Fewer Inquiries and in Declining Tonnages Placed—Sizable Work Awarded and on Inquiry

STRUCTURAL SHAPE PRICES, PAGE 1166

New York, Oct. 31.—Although fabricators are figuring on several substantial tonnages, little buying of special importance has been done. New inquiry also has been light, an addition to a state hospital in Brooklyn, involving 2000 tons, and the Mecca Masonic temple, mentioned last week as requiring between 2000 and 3000 tons, being outstanding. An apartment for Michael Paterno at Park avenue and Eighty-ninth street, New York, involving approximately 1000 tons, is expected to be brought up for figures shortly. Transportation difficulties, if anything, appear to be worse. Where embargoes are not actually in effect, the difficulty in making shipments is about as bad, due to the scarcity of cars. Many of the larger companies are endeavoring to cope with this situation by adding as rapidly as possible to their own car holdings. Prices on shapes continue around 2.00c to 2.10c, Pittsburgh, with small shipments available out of mill stocks at 2.20c.

Sizable Tonnage in Sight

Philadelphia, Oct. 31.—The shape demand is not as large as before but buying is fair and considerable tonnage is in sight. Prices range from 1.95c to 2.15c, Pittsburgh, depending upon size and delivery. Contrary to reports the Eastern Steel Co. has made no decision yet as to start either its blast furnace at Pottstown, Pa., or steel plant at Pottsville, Pa.

6000-Ton Job Up

Pittsburgh, Oct. 31.—Allegheny county commissioners will close bids Nov. 20 on about 6000 tons of structural shapes for the Fortieth street bridge, Pittsburgh. This is the largest local project to come up for attention in some time, and while delayed by various causes, it now seems to have taken definite form and doubtless will go through to completion. A few other railroad bridge awards are noted both to independent fabricators and to the American Bridge Co. The market on structural shapes has narrowed somewhat and now 2.00c to 2.15c is the representative range of quotations. While a number of school buildings and other small structures come up from time to time, and miscellaneous awards involving small lots of structural shapes are coming regularly to various companies here, the larger awards and industrial building activity largely is absent. Both eastern and central fabricators are in better shape to make deliveries than western fabricators. The latter have about six or eight months' work ahead while the former are booked up only from one to three months.

Structural Buying Is Less

Chicago, Oct. 31.—Demand for structural material is lessening as cold weather approaches, but fabricating shops have placed sufficient tonnage to carry them through the winter and mill deliveries are slow, which may interfere with prompt completion of work. A fair tonnage of steel was taken by fabricators during the past week, the Chicago Allerton hotel requiring 2300 tons, being awarded to the Bethlehem Steel Bridge Corp. Other tonnages let in the West were for moderate quantities. Prices remain unchanged at 2.10c to 2.20c, Chicago mill, for structural material.

CONTRACTS PLACED

Awards reported this week..... 16,761 tons
Awards reported last week..... 17,697 tons
Awards reported two weeks ago... 10,313 tons

6000 tons, coal pier for Virginian railroad, Norfolk, Va., to Bethlehem Steel Bridge Corp.
2300 tons, for Chicago Allerton hotel, Chicago, McLennan Construction Co., general contractor, to Bethlehem Steel Bridge Corp.
2700 tons addition to New York Times annex building, New York, to Levering & Garrigues.
1000 tons, addition to Tuller hotel, Detroit, to Riverside Bridge Co.
650 tons, highway bridge for Lake Erie & Western railroad, at Lima, O., to American Bridge Co.
633 tons, for building for Broderick & Bascom Rope Co., St. Louis, to St. Louis Structural Steel Co.
400 tons, Beach channel bridges, New York, to Bethlehem Steel Bridge Corp.
400 tons, Corn Products Co., Argo, Ill., to Vierling Steel Co.
400 tons, Medical Center building, Cleveland, to Forest City Steel & Iron Co.
395 tons for Chicago Mill & Lumber Co., to unidentified fabricator.
340 tons for Masonic temple, Butte, Mont., to Minneapolis Steel & Machinery Co.
300 tons, plant additions for Syrup Products Co., Yonkers, N. Y., to Bancroft & Jones.
250 tons, garage at Clarksburg, W. Va., to an independent fabricator.
250 tons, Altoona, Pa., high school to an independent fabricator.
250 tons, industrial building for Neally Nut & Bolt Co., Pittsburgh, to McClintic-Marshall Co.
200 tons, Youngstown, O., high school to Youngstown Structural Steel Co.
175 tons for bridges, Tama county, Iowa, to Clinton Bridge Works.
118 tons for one 80-foot and two 60-foot deck plate girder spans for the Missouri Pacific Railroad Co., to Virginia Bridge & Iron Co.
Tonnage not stated, Kirkland high school, Seattle, to Hofius Steel & Equipment Co.

CONTRACTS PENDING

6000 tons, Fortieth street bridge, Pittsburgh; bids close Nov. 20.
2700 tons, for addition to New York Times annex, New York, award expected today.
3500 tons, Elks club house, Philadelphia, pending.
3500 tons, buildings for National Biscuit Co., Philadelphia, pending.
2000 tons, state hospital addition, Brooklyn, pending.
1200 tons for Grand & Sixth commercial building, Milwaukee, bids being taken by Architects M. Tullgren & Sons, Milwaukee.
land, bids asked.
1000 tons, Young Men's Hebrew association, Philadelphia, pending.
700 tons, apartment building for Starrett Bros., East Seventy-fifth street, New York, bids being taken.
550 tons, building for Chevrolet Motor Co., Buffalo, bids being taken.
500 tons, office building for West Chester Lighting Co., Yonkers, N. Y., bids being taken.
300 tons, building for Valve Bag Co. of America, Oakmont, Pa., general contract to Hughes-Foulkrod Co.
200 tons, extension to plant of Ideal Electric Mfg. Co., Mansfield, O., bids being taken.
200 tons, extension to plant of General Electric Co., Pittsfield, Mass., bids being taken.
Tonnage not stated, foundation for public library building, Cleveland, bids being taken.

Army To Offer Ordnance

Washington, Oct. 31.—Condemned ordnance at the Watervliet, N. Y., arsenal, including five lathes, some shafting and auxiliary equipment, will be offered for sale on Nov. 23. Approximately 100 tons of steel forgings will be sold by the Sparta ordnance reserve board at Sparta, Wis., under bids to be opened Nov. 4. At Toledo, on Nov. 13, bids will be opened by the Toledo ordnance reserve depot on the sale of cast and malleable iron shell, brass and copper components, steel components and shells and similar surplus material.

More Tin Plate

Tonnages Are Sought—Mills Continue High Operating Rate

TIN PLATE PRICES, PAGE 1166

Pittsburgh, Oct. 31.—Among recent entrants into the tin plate market is the Standard Oil Co. for 150,000 to 175,000 base boxes. So far as reported here, this business has not been placed, an effort being made to obtain more prompt deliveries than are indicated as possible by mills figuring on the tonnage. The Texas Co. also is negotiating for tin plate for exportation of oil. Specifications continue to be furnished regularly on contracts and tin plate mill operation is on an average basis in excess of 75 or 80 per cent. The American Sheet & Tin Plate Co. operated 60 per cent of its hot mills last week, indicating that about 65 or 68 per cent of tin mills were active. While several months ago American tin plate producers figuring on tin plate for export made some extremely low figures, around $4 per base box in competition with British prices, they are at present paying more attention to their costs, which have been upon a steadily rising scale. At present, most are reluctant to quote even as low as $4.60. The regular domestic market is unchanged at $4.75 per base box of 100 pounds, Pittsburgh, although the likelihood is an advance will be inaugurated shortly.

Talk Price Advance

New York, Oct. 31.—The Standard Oil Co. of New Jersey has not yet closed its inquiry for 150,000 boxes of tin plate for its Bayonne plant. This is to be used in putting up package oil for the foreign markets. Independent interests are talking about putting up the price of tin plate in the next few days to $5 base Pittsburgh, but nothing definite yet has developed along this line.

Prices Are Watched

Philadelphia, Oct. 31.—While not much interest is shown in tin plate, some consumers contemplate placing forward requirements shortly. Therefore the price situation is being watched closely in view of the intimations by some producers they would announce a new price within the next few days. A new price of $5.00 Pittsburgh per base box is reported in some quarters, but it is believed elsewhere $4.75 may be continued. Meantime business is confined to stock lists which is selling $4.35 to $4.50 Pittsburgh.

To Build Warehouse

The Lukens Steel Co., Coatesville, Pa., will erect a warehouse at New Orleans and later will erect a fabricating plant there. The buildings will be located on the New Orleans inner harbor or industrial canal on a land

which is part of the site of the shipyard operated during the war by the Foundation Co. The initial installation of the Lukens company is expected to comprise four units, each 250 x 75 feet.

Wire and Nail

Buying Is in Less Volume—Orders Are for Small Lots

WIRE PRICES, PAGE 1166

Pittsburgh, Oct. 31.—Wire products makers note a more or less unbalanced demand for while sales of nails and plain wire are numerous, bookings in connection with barbed wire are few and little or no demand for fencing is noted. Wire products manufacturers are able to maintain approximately 70 per cent operating schedules. Farmers are not buying and jobbers, although offered spring terms, are not placing sizable tonnages. The Cambria Steel Co. whose prices are $1 per ton above Pittsburgh district wire products makers, has lost numerous orders in this territory but reports that bookings in the East, particularly Philadelphia, at its higher schedule take up practically its entire output. Prices are unchanged on the basis of 2.45c for plain wire and 2.70c, for nails.

New Buying Is Less

Chicago, Oct. 31.—New business in wire and nails is in somewhat less volume than early in the fall, largely due to inability to obtain deliveries. It is noted such business as is coming to sellers is in smaller lots than usual. Wire production is no better than during recent weeks and it seems impossible to increase the output. Prices are unchanged.

More Stacks To Blow In

Philadelphia, Oct. 31.—The Robesonia Iron Co., Robesonia, Pa., will blow in about Nov. 15 on foundry and low phosphorus, but the Sheridan, Pa., stack of the Lavino Furnace Co. will switch from foundry to ferromanganese early in November. No decision has been made yet whether to light three furnaces in this district which were expected to blow in when coke was obtainable but the outlook is they will not be lighted under present market conditions. Max Meadows is the only active furnace in Virginia. While several other Virginia furnaces contemplate blowing in, the only one definitely scheduled is Pulaski to be lighted about Nov. 10.

Orders Lake Boats

New York, Oct. 31.—The United States Steel Products Co. has placed an order with the Federal Shipbuilding Co. for the construction of two 250-foot vessels of the lake ore carrier type. These boats will be unique in the lake trade in that they will be propelled by diesel engines. While of the usual lake type, their size will permit them to be operated from lake ports to the coast. The boats will be built at the Federal plant at Kearny, N. J. Both the United States Steel Products Co. and the Federal Shipbuilding Co. are subsidiaries of the United States Steel Corp.

More Car Inquiries Appear

New Needs Add 15,000 to Pending List, Making Total Approximately 45,000—Represent 400,000 Tons of Steel—Orders Total 3000

RAILROAD TRACK MATERIAL PRICES, PAGE 1166

Chicago, Oct. 31.—With a total of 45,000 freight cars and 700 passenger cars now on inquiry, practically all these for western roads, builders and steel mills are faced with the heaviest demand in this line that ever has presented itself, except when the government bought 100,000 cars during the war. In addition to this total, an eastern railroad is said to be about to place an inquiry for 30,000 additional cars. During the past week inquiries for 10,700 cars have come out. The cars now on inquiry will bring to steel mills a total of about 450,000 tons of steel. Railroads continue to be the heaviest buyers and prospective buyers of steel and the rail tonnage recently placed, with the steel necessary for car requirements, are making up a heavy percentage of steel production during next year. Demand for light rails is slack and presents almost the only weak spot in the steel market. This undoubtedly is due to slack operation of mines.

4800 Cars On Inquiry

New York, Oct. 31.—Inquiries for 3500 cars for the Northern Pacific and 1300 for the Western Pacific are outstanding in current new inquiry for railroad equipment. A leading order calls for 500 miscellaneous freight cars for the Maine Central.

Locomotive inquiries include 75 for the Illinois Central. The Great Northern is contemplating the purchase of 50 locomotives, and the Minneapolis & St. Paul is said to be figuring on 25. A recent order calls for eight for the Maine Central, the business going to the Lima Locomotive Works.

Meeting Reroller's Price

Pittsburgh, Oct. 31.—Competition is becoming more keen on light rail business. Buying is upon a somewhat more limited scale than was the case a few weeks ago due to the disposition on the part of coal companies to order only immediate requirements. Because of the coal shortage they are able only to operate two or three days a week and hence are not penetrating far into the mines. Either because it wanted to obtain the majority of the orders being placed, or else because it was inclined to meet the prices frequently quoted by rerollers, an independent steel company has been accepting light rail business during the past week at $2 or $3 per ton under the 2.25c, base Pittsburgh, figure prevailing hitherto. Other makers have followed with similar figures so that the market is quotable at 2.15c, base Pittsburgh. Only a few small orders have been placed since a week ago. Track fastening orders continue more or less spasmodic. A few orders are being placed now and then but the larger transactions seem all to have been taken care of for a time at least. Standard spikes still are quoted at 2.75c to 3.00c; small spikes at 3.50c to 3.75c; tie plates at 2.25c to 2.35c, and track bolts at 3.85c to 4.50c, base Pittsburgh.

CAR ORDERS PLACED

Maine Central, 460 miscellaneous freight cars to Keith Car & Mfg. Co., 50 gondolas to Standard Steel Car Co., and seven baggage cars to Osgood Bradley Car Co.

Lehigh & New England, 100 gondolas, to the Magor Car Corp.

Soo line, 800 gondolas and 1000 stock cars to the Pullman Co., 500 box cars to American Car & Foundry Co.

Chicago Northwestern, 800 ore, to Pullman Co.

CAR ORDERS PENDING

Northern Pacific, 3000 box and 500 gondolas, bids asked.

Western Pacific, 800 gondolas and 500 stock, pending.

Denver & Rio Grande, 800 gondolas, 1000 stock cars, bids asked.

Great Northern, 5900 cars, various types, bids asked.

Union Refrigerator Transit Co., to buy 1000 cars at once and 500 more later.

St. Louis & Southwestern, 500 box and 300 automobile, bids asked.

Chicago Northwestern, 46 miscellaneous passenger, bids asked.

Piled Steel

Being Reduced at Pittsburgh as Transportation Eases Works Gain

Pittsburgh, Oct. 31.—Some improvement in the transportation situation has enabled steel mills to reduce stocks, which during the recent tieup, because of embargoes, etc., were piled. Progress already made amounts in some cases to 30 or 40 per cent. This is noted in connection with some of the sheet and wire mills and the chief reason why a better record has not been possible is due to the car shortage which still is severe, cars being called in to Erie, Buffalo and other points for shipment of grain and western roads calling in their cars on foreign lines. Many of the steel mills refused to pile their output during the transportation emergency and companies at Duquesne and other points near Pittsburgh stated they would roll the steel desired contingent upon customer's guarantee to remove it from floors or loading platforms. By the use of automobile trucks the floors were kept clear and a repetition of the 1920 experience was avoided.

While blast furnace operation has increased greatly since Oct. 1, something like 10 or 12 blast furnaces being lighted in this district alone, the steel mills also have been gaining. At present the average is slightly in excess of 70 per cent with some plants running as high as 80 per cent. A few strip steel mills which were below 50 per cent three weeks ago now are at 80 per cent. The American Sheet & Tin Plate Co. was able to engage 60 per cent of its hot mills last week as against probably 54 per cent the preceding week. It expects above 65 per cent will be reached this week. The blast furnaces to become active recently were the Top furnace at Wheeling, of the Wheeling Steel & Iron Co., the last of the Aliquippa furnaces of the Jones & Laughlin Steel Co. and the seventh of the Johnstown, Pa., group of the Midvale Steel & Ordnance Co. The Carnegie Steel Co. keeps 39 out of 59 active.

Reinforcing Bars Active

Small Lots Continue To Occupy Fabricators—Winter Let up Reflected—Several Sizable Tonnages Pending—PricesUnchanged

REINFORCING BAR PRICES, PAGE 1166

Pittsburgh, Oct. 31.—Although in recent years pouring of concrete and the corresponding use of concrete bars continues all through the winter the trade experiences a letup in October and November. That is true this year. Only a few orders are being placed, none of which involves tonnage of size. One or two fair sized awards are expected soon when bids now being tabulated will be acted upon. It is expected the 1000 tons needed for the Schenley apartments will be purchased now since during this past week the Mellon-Stuart Co. received the general contract. From 2.00c to 2.15c is a fair range of quotations although as high as 2.25c has been obtained on some small lots.

Library Foundation Up

Cleveland, Oct. 31.—Concrete bar fabricators are figuring on a round tonnage for the foundation for the proposed new Cleveland library. The main portions of the building are to come up later. The 200 tons for the Collinwood high school has been awarded to the Bourne-Fuller Co. No decision has been made in the bar tonnage for the Halle Bros. Co. addition. The hospital work for the government at Camp Sherman, O., reported last week, still is in the indefinite stage but calls for 29 buildings to be built in units, each of which will require a sizable lot of bars. Prices continue at 2.00c to 2.10c, Pittsburgh, and 2.50c from warehouse.

Prices Being Shaded

Chicago, Oct. 31.—While 2.50c, Chicago warehouse, continues as the nominal quotation on reinforcing bars, this is being shaded on attractive business, with 2.35c, Chicago, commonly named and 2.25c, Chicago, bid on especially desirable business. A further drop in bookings has taken place during the past week. Usually demand tapers off as cold weather approaches but in the present instance it held up longer than usual and declined more rapidly. A fairly large tonnage of material is still pending in various projects, which probably will be placed and business is by no means unusually slack. Small tonnages are being taken as usual, but the total business is much less than during the past few weeks.

CONTRACTS PLACED

Awards reported this week	**2,765 tons**
Awards reported last week	**3,880 tons**
Awards reported two weeks ago	**9,197 tons**

375 tons, Altoona, Pa., high school, to American Steel & Engineering Co., Philadelphia; bars probably will be furnished by Ft. Pitt Bridge Co.

600 tons, Johnstown, Pa., terminal warehouse; bars to be furnished by William Steele & Son, Philadelphia, architects and engineers.

150 tons, Central Normal dormitories, Mt. Pleasant, Mich., to Prost, Ford & Westall, general contractors, bars to a Detroit warehouse.

300 tons, Judson hotel, Chicago, to Barton Spiderweb System.

250 tons, highway work in Missouri to Concrete Steel Co.

120 tons, addition to state penitentiary, Pendleton, Ind., to Concrete Steel Co.

250 tons, National Banknote Co., Chicago, to Truscon Steel Co.

350 tons for Pine Grove apartments, Chicago, to Truscon Steel Co.

200 tons, Collinwood high school, Cleveland, to Bourne-Fuller Co.

170 tons, power plant at Lorain, O., for Ohio Public Service Co., to Franklin Steel Works and Patterson-Leitch Co.

CONTRACTS PENDING

175 tons, Carrick high school, Pittsburgh, bids close Nov. 1.

110 tons South high school, Pittsburgh, bids being taken.

300 tons, building for Chicago Mill & Lumber Co., general contract to Muller Construction Co.

100 tons, research laboratory for University of Illinois, Chicago, general contract to C. A. Moses Construction Co.

100 tons for library bureau, Chicago, bids asked.

Tonnage not stated, foundation for public library building, Cleveland, bids being taken.

Wrought Pipe

Prices Advanced $2 on Less Than Carload Lots—Buttweld Is Active

PIPE PRICES, PAGE 1166 AND 1234

Pittsburgh, Oct. 31.—Effective Oct. 28 the A. M. Byers Co. advanced its prices on less than carload lots of black and galvanized wrought iron pipe $2 a ton, lowering its discounts one point. Aggregate tonnages of buttweld full weight merchant pipe on the books of producers in this and in nearby districts are described as "enormous." There appears to be no letup in demand and while individual orders are not large they come from scattered sources and furnish enough business to make it necessary for the mills to quote deferred deliveries from 8 to 12 weeks. Little or no lapweld pipe is wanted. The average dwelling house requires 5 tons of buttweld pipe and the average apartment house or school house, a carload or two, so that as viewed by pipe producers there still is a widespread building boom. The Schenley apartments, Pittsburgh, now in the course of construction, will require 200 to 250 tons of pipe, being one of the largest structures erected for dwelling purposes in Pittsburgh since the William Penn hotel was built. The award is expected to be made today or tomorrow by the Mellon-Stuart Co., which recently was awarded the general contract, and it is expected that wrought iron pipe will be purchased. Oil country demand has slackened up considerably, line pipe and casing orders being confined to scattered small lots. Considerable difficulty still is being experienced because of car shortages, but users are none the less insistent for deliveries on that account.

Lull Continues

Chicago, Oct. 31.—Except for the fact that prompt delivery pipe already on cars finds a ready market among those finishing up their season's work, the market for cast iron pipe is dull. Deliveries from foundries have been so poor during the past season that much work is left undone and a great deal of pipe will go over for delivery into next year. Buying practically is at a standstill. There is much repressed demand which would come out if price and delivery were favorable. Under present circumstances, shops will have plenty of business for the winter and every probability of much new business early in the season. The market appears to be steady at $43 to $44, Birmingham, for 6-inch pipe, equal to $51.20 to $52.20, delivered, Chicago. The United States Cast Iron Pipe & Foundry Co. has taken 730 tons for Chicago and the American Cast Iron Pipe Co. 700 tons for Westmont, Ill.

Makers Booked Up

New York, Oct. 31.—October has seen exceptionally good business in cast iron pipe for this season of the year. Municipal demand fell off rather sharply, but private buying aggregated a good tonnage, and is continuing to be placed actively. Prices have been and continue steady. Makers generally are booked up to around Jan. 1.

Market Slowed Down

Birmingham, Ala., Oct. 30.—The cast iron pipe market is not so active, in new business, but production and shipments are good. Indications point to an early opening of the market again on pressure pipe. The McWane Cast Iron Pipe Co. has received an order from Detroit following the recent order from Philadelphia for a sizable tonnage of the small pipe. Negotiations are under way for further business.

Old Ferrosilicon

Contracts Keeping Producers Busy—Small Lots of Alloys Sold

FERROALLOY PRICES, PAGE 1166

New York, Oct. 31.—Producers of 50 per cent ferrosilicon are busy making deliveries on the old contracts which bear prices $10 to $15 below the current market and the amount of alloy available for sale to new customers is extremely limited. While the current market is $70 to $75, delivered, sales as high as $86, delivered at a Wisconsin point, are reported.

High carbon ferrochrome, 4 to 6 per cent, is quoted 12 to 14 cents a pound contained. Low carbon ferrochrome, 1 to 2 per cent, of foreign origin, continues offering at 28 cents. New business is light, but specifications on old contracts are good.

The tungsten market is firm. Concentrates have sold at $7.50; ferrotungsten at 92 cents a pound contained; and powder at $1.

Ferrovanadium is steady at $3.50 to $4 a pound contained.

Some Manganese Ore Sold

Philadelphia, Oct. 31—The only manganese ore sales made here since the application of duty under the new tariff involve a few carloads of Brazilian from stock. These sold slightly under the c.i.f. tidewater market prices plus duty.

Alloys Lack Life

Pittsburgh, Oct. 31.—Ferroalloy business lacks life, in that large inquiries and sales are absent. Such deals as are consummated are comparatively small. In connection with ferromanganese, a few 50 or 100-ton lots

have been disposed of at $100, f.o.b. furnace, or $100 f.o.b. Harrisburg, Pa. The English price continues unchanged at $101.10, Baltimore base, duty paid, carrying the same freight to Pittsburgh as from Harrisburg, $4.79. Included in the list of recent buyers is the Follansbee Brothers Co. The American Radiator Co., now is in the market for 50 tons for Black Rock and one or two other users are asking for similar amounts. This probably will be the character of buying until after Jan. 1. In connection with spiegeleisen, no new inquiries are noted and only an occasional sale of a single carload at $37 to $38, f.o.b. furnace, is noted.

Less-than-carload quantities rule in connection with other alloys. Recent sales of ferrotungsten and ferrovanadium have involved 100 pounds at a time. Prime ferrotungsten is quoted at a minimum of 95 cents while ferrovanadium is unchanged at $3.50. A recent quotation of 13½ cents on a small inquiry for 4 to 6 per cent carbon ferrochrome lost the business. The market on this grade is quoted at 12 to 13 cents. Ferrosilicon, 50 per cent, is inactive no inquiry nor sales being noted. The last purchases recorded were on the basis of $67.50, freight allowed.

Warehouse Demand Still Fair; Prices Hold

WAREHOUSE PRICES, PAGE 1230

New York, Oct. 31.—While stocks at the larger warehouses are fair, a shortage is developing in some descriptions, such as bar angles and certain band sizes. The difficulty in getting shipments from the mills is largely responsible. Demand generally is of a steady character, with business in October not as large as in the preceding month. Prices are unchanged.

Expect Fair Demand

Philadelphia, Oct. 31.—Demand for iron and steel products out of warehouse is well maintained. Jobbers are confident of a fair order volume the balance of the year and prices are firm at the established levels although on some odd lots shading has developed.

Demand for Structurals Strong

Buffalo, Oct. 31.—Demand for structural material from warehouse during October has been fairly heavy due to jobs being hurried before cold weather sets in. Bar demand also is good. Warehouses in this territory have no difficulty in getting material.

Demand Is Fair

Cleveland, Oct. 31.—A jobber in sheets in this district reports its October business was the largest so far this year. Demand continues fair but is not large. There is some improvement in deliveries from mill. Stocks of some materials are low. Prices are unchanged.

A meeting of the directors of the Scovill Mfg. Co., Waterbury, Conn., has been called for Nov. 4 to consider increasing the capital stock from $5,000,000 to $15,000,000. If the plan is authorized a 200 per cent stock dividend will be declared.

The Nonferrous Metals

Zinc, Tin and Lead Reach Record Prices—Export Buying of First Named by London Is Factor—Copper Dull

	Copper—Electro delivered	Copper—Lake delivered	Spot Straits New York	†Lead New York basis	Zinc St. Louis basis	Spot† aluminum	Spot antimony	Nickel spot
Oct. 25	13.87½	14.12½	36.00	6.65	7.05	20.50	6.75	32.00
Oct. 26	13.87½	14.12½	36.25	6.70	7.12½	20.50	6.75	32.00
Oct. 27	13.87½	14.12½	36.87½	6.75	7.15	20.50	6.75	32.00
Oct. 30	13.87½	14.12½	37.85	6.85	7.12½	20.50	6.75	32.00
Oct. 31	13.87½	14.12½	37.37½	6.85	7.12½	20.50	6.75	32.00

†Outside market quotation.

NEW YORK, Oct. 31.—The bull markets in tin, zinc and lead have brought prices for these metals to the highest levels in two years. Copper has lagged behind in an uncertain and colorless market, devoid of interest. Aluminum, antimony, nickel and other markets have shown little activity and no price changes.

Most copper sellers have been willing to take business at 13.87½c, delivered, and there have been occasional offerings at 13.75, delivered. Consumers have been rendered less confident by the reports of cheap copper and have been buying conservatively. Foreign buying also has been light, with keen competition between the Copper Export association and independent exporters. The copper situation is considered strong statistically, with stocks down to normal, but the increasing supplies of low cost South American copper are a factor receiving considerable thought. Foundries continue active, paying 13.40c to 13.50c, refinery, for casting copper.

Zinc advanced to above 7.10c the past week, with a renewal of European buying in the American market. London quotations have followed American quotations upward over several months, but on Thursday last the London parity exceeded American prices and fully 4000 tons of American zinc were bought for export. This withdrawal from the already tight American supply has accentuated the strong position here. Domestic consuming prospects are good, both in the galvanizing and brass trades over the next several months. Zinc sheet base was advanced ¼c to 9.00c, effective Oct. 27.

Lead prices in the outside market gradually have advanced, until on Monday Missouri lead was quoted 6.50c, St. Louis; 6.85c, New York, against 6.30c, St. Louis, and 6.50c, New York, the official price of the American Smelting & Refining Co. It has been expected that after Oct. 31 the Smelting company would change its price. Business has been moderate in pig lead, but some of the most important sellers are out of the market, sold up for November.

Tin has been engaged in the most spectacular bull movement of the past two years, London prices having gone up about £20 in the past month. The sales from Oct. 1 to Oct. 30 in London aggregated about 21,000 tons, or about as much as the world will produce in three months, indicating the speculative interest shown abroad. American traders have been viewing the movement with doubt, but occasional American short sales have been followed by a scurry to cover, and prices have gone all the higher. Straits tin price advanced about 2.00c the past week to 37.85c as of Oct. 30. Today it reacted fractionally. Ninety-nine per cent tin has been quoted ½ to ¾ cent under Straits. Some American electrolytic tin has been offering for January delivery.

Antimony has been dull, consumers being well supplied. The price of spot carlots is unchanged at 6.75c, duty paid. Holders of foreign ingot aluminum in warehouse are offering metal ¼ cent below the domestic producer's prices of 21c for 98 to 99 per cent virgin and 22c for 99 per cent.

Mill Products

(Base prices, f.o.b. mill)

SHEETS	
Copper, hot rolled 24 oz., min	21.50
High brass	18.50
Zinc, ga. 9 to 18 (plates ½c less)	9.00
Lead, full sheets (cut, ¼c more)	9.75
Aluminum, base 18 ga. and up	37.40
SEAMLESS TUBES	
High brass	23.00
Copper	24.75
RODS	
High brass, round, ⅛ to 2½ inch	17.00
Naval brass rod	19.00 to 19.50
WIRE	
Copper	15.50 to 16.00
High brass	19.00

Old Metals

(Dealers' Buying Prices)

HEAVY RED BRASS	
Cleveland	9.00 to 9.50
New York	8.50
Chicago	8.50
HEAVY YELLOW BRASS	
New York	6.25 to 6.50
Chicago	6.50
Cleveland	6.00 to 6.50
ZINC	
New York	4.00 to 4.25
Cleveland	3.50 to 4.00
HEAVY COPPER AND WIRE	
Cleveland	11.00 to 11.50
New York	11.00 to 11.50
Chicago	11.00
RED BRASS TURNINGS	
New York	7.75 to 8.25
Cleveland	8.00 to 8.50
YELLOW BRASS TUBING	
Cleveland	6.00 to 6.50
NO. 1 BRASS ROD TURNINGS	
Cleveland	6.00 to 6.50
New York	6.75 to 7.00
Chicago	6.00
ALUMINUM BORINGS	
Cleveland	7.00 to 8.00

Oliver Completes Wage Readjustments

Duluth, Oct. 31.—Wage increases have been announced by the Oliver Iron Mining Co., subsidiary of the United States Steel Corp., to apply to all employes not included in the 20 per cent advance made to mine laborers Sept. 1. With this readjustment, retroactive to Oct. 1, all employes of the Oliver company are brought back to the wage scale prevailing prior to Sept. 1, 1921, when a reduction was made.

Operations of iron mining companies are being increased on the Minnesota ranges, but an acute labor shortage is experienced. Production from underground mines during the winter will show large gains over last season. Shipments by the independents to the Great Northern docks at Superior will be maintained up to the end of navigation. The Oliver company is likely to conclude its shipments about Nov. 15.

The appeal of Capt. Alexander McDougall in his suit against the Oliver company for alleged infringement of a patent on an ore washing machine has been dismissed by the United States court of appeals.

Fixes Assessing Method

Washington, Oct. 31.—In assessing tariff duties upon manganese, tungsten, molybdenum and other ores and ferromanganese, ferrosilicon and the other ferroalloys, the customs service may use the determination of content for settlement between buyer and seller, Assistant Secretary of the Treasury Clifford has ruled to the collector of customs at New York. The appraiser at New York had recommended this course in view of the difficulty and expense of commercial sampling. However, samples will be taken to check back upon the buyer-seller settlement. The collector at New York also has been authorized to base duties upon importations of manganese ore on a 50 per cent content.

Societies Aid Research

Washington, Oct. 31.—By eliminating duplication and enabling a pooling of resources, trade associations are performing a valuable service in furthering scientific research, says the fabricated production department to the chamber of commerce of the United States. American industry is now expending $70,000,000 annually on research, according to the chamber, this being about evenly divided between laboratory research and experimental and development work in plants. A continually increasing number of trade associations is realizing the value of research as a constructive activity.

Steel Corporation Shows Gain in Earnings

United States Steel Corp. earnings in the third quarter this year would have paid full dividends without touching the surplus had September profits maintained the pace of the two earlier months. The September slump apparently was due to the transportation tieup. As it was, the total was $27,468,339, or slightly more than in the second quarter. Compared with a year ago, the quarter showed a gain of nearly $9,000,000. In that period $6,965,504 was taken from surplus as against only $1,339,602 in the quarter recently ended. The comparative income accounts follow:

	Third quarter 1922	Second quarter 1922	Third quarter 1921
Total earnings	$27,468,339	$27,286,945	$18,918,058
Depreciation and sinking fund	11,170,945	11,067,432	8,143,796
Net income	$16,297,394	$16,219,513	$10,774,262
Int. and bond premiums	4,978,296	5,023,158	5,081,066
Balance for dividends	$11,319,098	$11,196,355	$ 5,693,196
Preferred dividend	6,304,919	6,304,919	6,304,919
Common dividend	6,353,781	6,353,781	6,353,781
Balance for surplus	*$1,339,602	*$1,462,345	*$6,965,504

*Deficit.

By months this year earnings were reported as follows, with August ranking second only to June:

1922	
September*	$ 7,019,590
August*	10,615,085
July*	9,833,654
June*	10,712,004
May*	8,824,887
April*	7,750,054
March*	8,505,166
February*	6,180,685
January*	4,656,134

*After excess profits tax.

Seek Stratton's Successor

Washington, Oct. 31.—Secretary of Commerce Hoover has asked representative engineering societies to propose candidates for the post of director of the bureau of standards, to succeed Dr. S. W. Stratton on Jan. 1 when he leaves to become president of the Massachusetts Institute of Technology at Boston. Men now with the bureau will be considered.

In addition to filing reduced rates on coke shipments to Virginia blast furnaces, the Chesapeake & Ohio and Norfolk & Western railroad also have materially reduced the rates on iron ore and limestone to these furnaces.

Tin Plate Plants Gain in Two Years

Washington, Oct. 31.—Value of the output of tin and terne plate plants in 1921 was $99,128,800 compared with $181,789,200 in 1919, a decrease of 45.5 per cent, the census bureau reports. Meanwhile, the number of plants making tin and terne plate had increased from 23 in 1919 to 32 in 1921. The census bureau's comparison of the value of the production in 1921 with 1919 is as follows:

	1921	1919
Total value of products	$99,128,800	*$181,789,200
Tin plate:		
Pounds	1,638,373,000	2,388,867,000
Value	$90,531,000	$165,846,100
Coke—		
Pounds	1,605,958,000	2,352,317,000
Value	$88,293,200	$162,762,100
Charcoal—		
Pounds	32,415,000	36,550,000
Value	$2,267,800	$3,084,000
Terne plate:		
Pounds	87,408,000	124,920,000
Value	$5,650,500	$8,296,600
Other sheets (long ternes):		
Pounds	9,864,800	50,860,000
Value	$580,400	$3,054,900
All other products including plates redipped, goods retinned, and custom work and repairing	$2,366,965	*$4,591,600

*Includes value of products of eight retinning establishments to the amount of $143,700, figures for which are not included in the tin plate and terne plate industry in 1921.

Do Not Favor Conference

Washington, Oct. 31.—No possibility exists at this time for an international financial conference to consider war debts as proposed by Judge E. H. Gary, according to indications at the White House, the treasury and the department of commerce. It is stated at the White House that while the government is willing to lend its approval to an economic conference looking to betterment of the old world situation, it cannot go into any conference on the debt matter until economic problems of Europe have been threshed out by experts.

Revive Basing Point Case

Washington, Oct. 31.—Attorneys for the federal trade commission in the Pittsburgh basing point case tomorrow will begin winding up the prosecution. It is believed that the commission can close its case in two weeks. Heretofore all testimony has been taken at points away from Washington before Examiner Bennett. It seems probable that some members of the commission will sit with Examiner Bennett so long as the hearings are held here. When the commission closes, the United States Steel Corp. will begin its defense. Whether this will be done in Washington or some other city has not been announced.

The Business Trend

November 2, 1922

TRADE TODAY, TOLD BY IRON TRADE REVIEW CHARTS

GENERAL SITUATION—Industry and trade more active now than at any time since the spring of 1920; prices of many commodities, save iron and steel and copper, firm and rising; country seems assured of prosperous times until late in 1923, at least.

FREIGHT SITUATION—Car shortage record-breaking; exceeds 1920 peak; car loadings make large gain; traffic congestion no great check upon industrial activities yet.

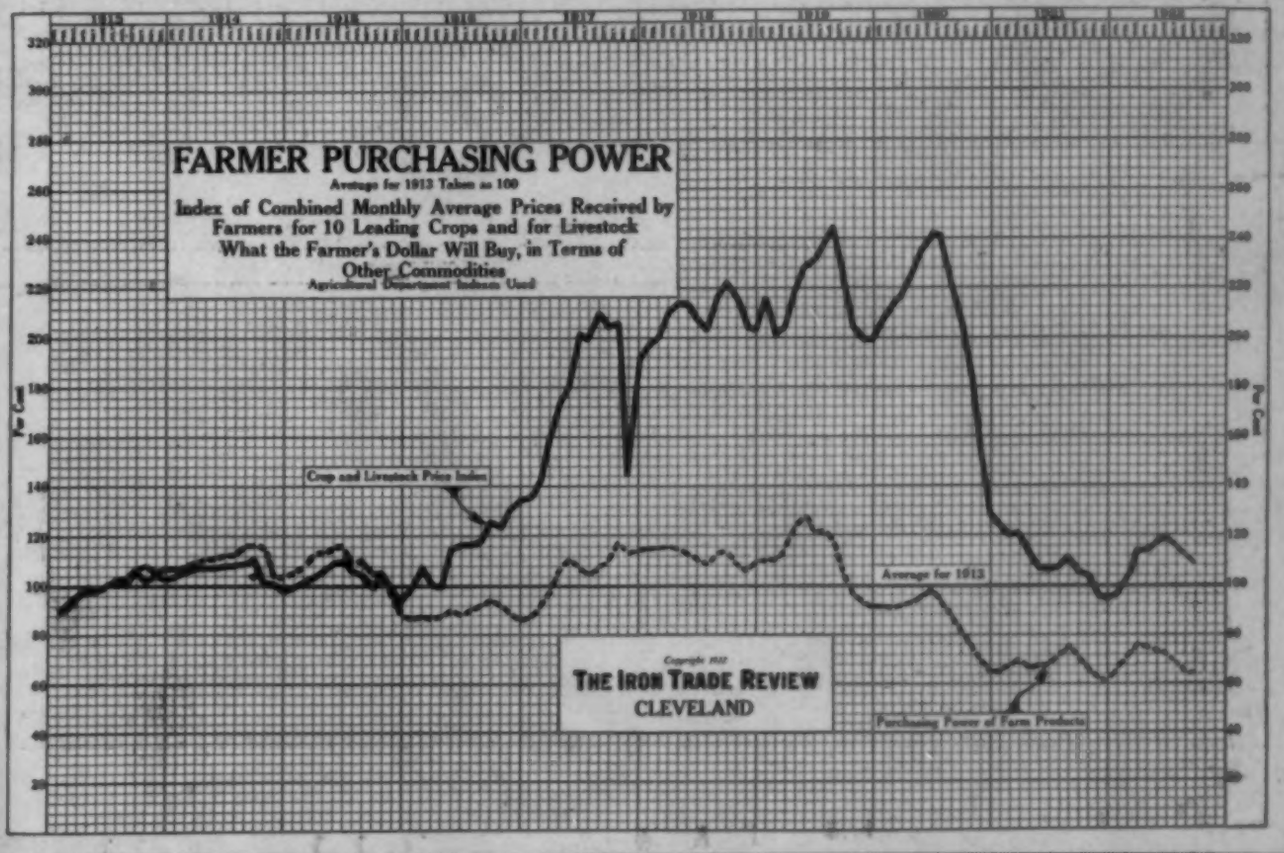
COMMODITY PRICES—Chart shows how iron and steel price index now exceeds other commodity groups; farm products values up also; general price trend upward.

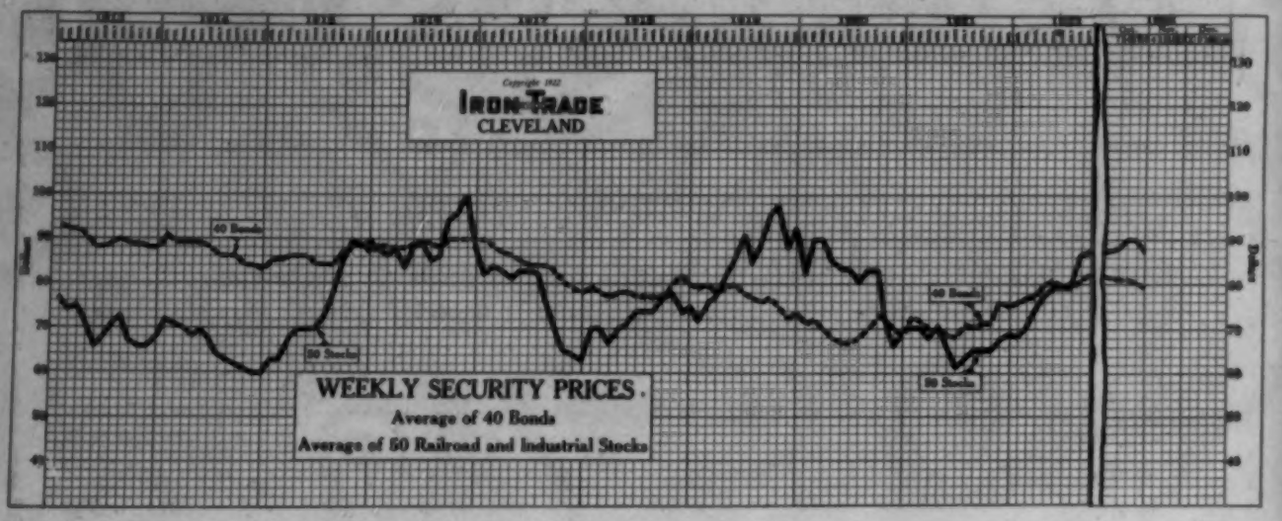
CREDIT SITUATION—Sharp rise in cash ratio of federal reserve system last week reflects absence of strain on huge credit resources; interest rates may stop rising soon.

IMMIGRATION—Growing labor shortages held serious obstacle to full prosperity; due to immigration restrictions; agitation begins for change in Johnson 3 per cent law.

SECURITY PRICES—Stock market has witnessed sharp reaction from overdone speculative advance; bonds decline as large institutions sell.

FOREIGN TRADE — September exports gained slightly; drop in imports due to inclusion of totals only up to Sept. 21, when new tariff law became effective.


FARMER PURCHASING POWER
Average for 1913 Taken as 100
Index of Combined Monthly Average Prices Received by Farmers for 10 Leading Crops and for Livestock
What the Farmer's Dollar Will Buy, in Terms of Other Commodities
Agricultural Department Indexes Used
Crop and Livestock Price Index
Average for 1913
Purchasing Power of Farm Products
THE IRON TRADE REVIEW
CLEVELAND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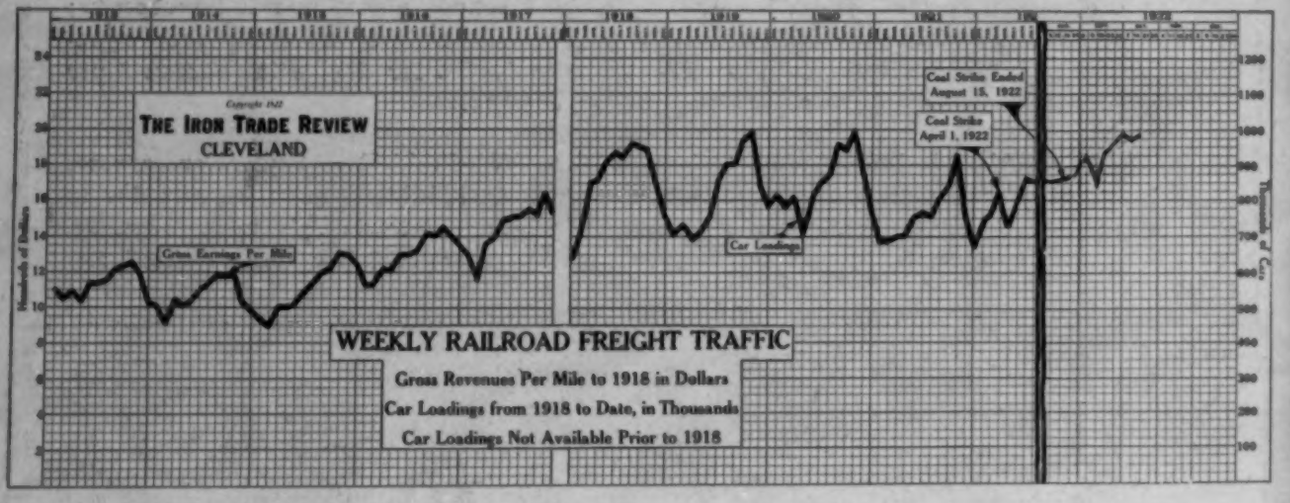
50 Stocks
WEEKLY SECURITY PRICES.
Average of 40 Bonds
Average of 50 Railroad and Industrial Stocks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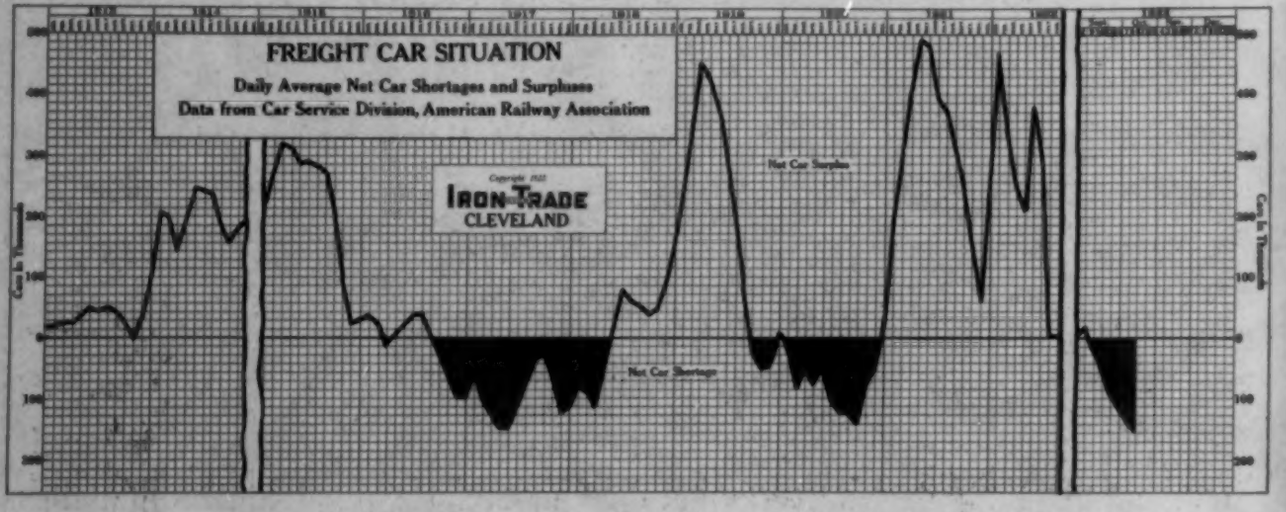
CLEVELAND
Gross Earnings Per Mile
Car Loadings
Coal Strike Ended August 15, 1922
Coal Strike April 1, 1922
WEEKLY RAILROAD FREIGHT TRAFFIC
Gross Revenues Per Mile to 1918 in Dollars
Car Loadings from 1918 to Date, in Thousands
Car Loadings Not Available Prior to 1918


FREIGHT CAR SITUATION
Daily Average Net Car Shortages and Surpluses
Data from Car Service Division, American Railway Association
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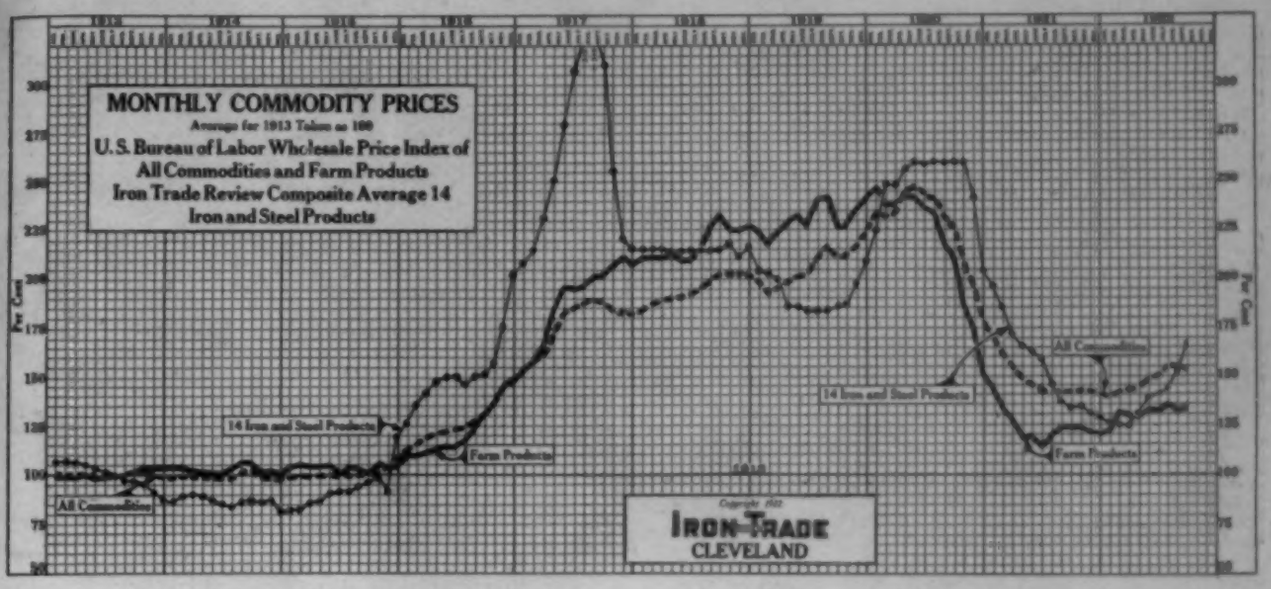
Net Car Surplus
Net Car Shortage


MONTHLY COMMODITY PRICES
Average for 1913 Taken as 100
U.S. Bureau of Labor Wholesale Price Index of
All Commodities and Farm Products
Iron Trade Review Composite Average 14
Iron and Steel Products
14 Iron and Steel Products
Farm Products
All Commodities
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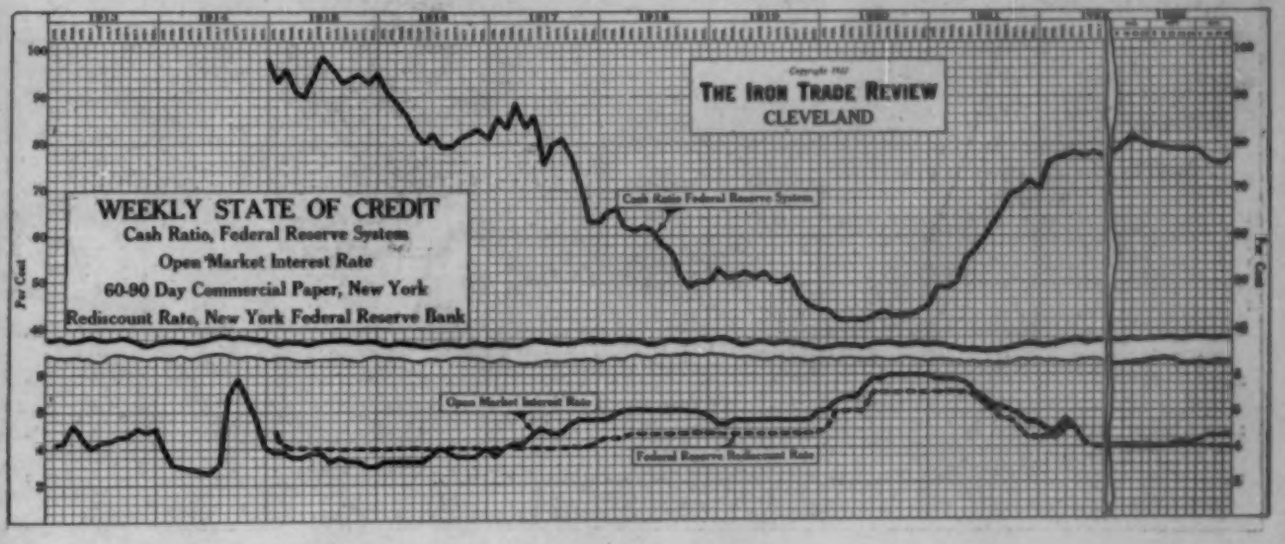
WEEKLY STATE OF CREDIT
Cash Ratio, Federal Reserve System
Open Market Interest Rate
60-90 Day Commercial Paper, New York
Rediscount Rate, New York Federal Reserve Bank
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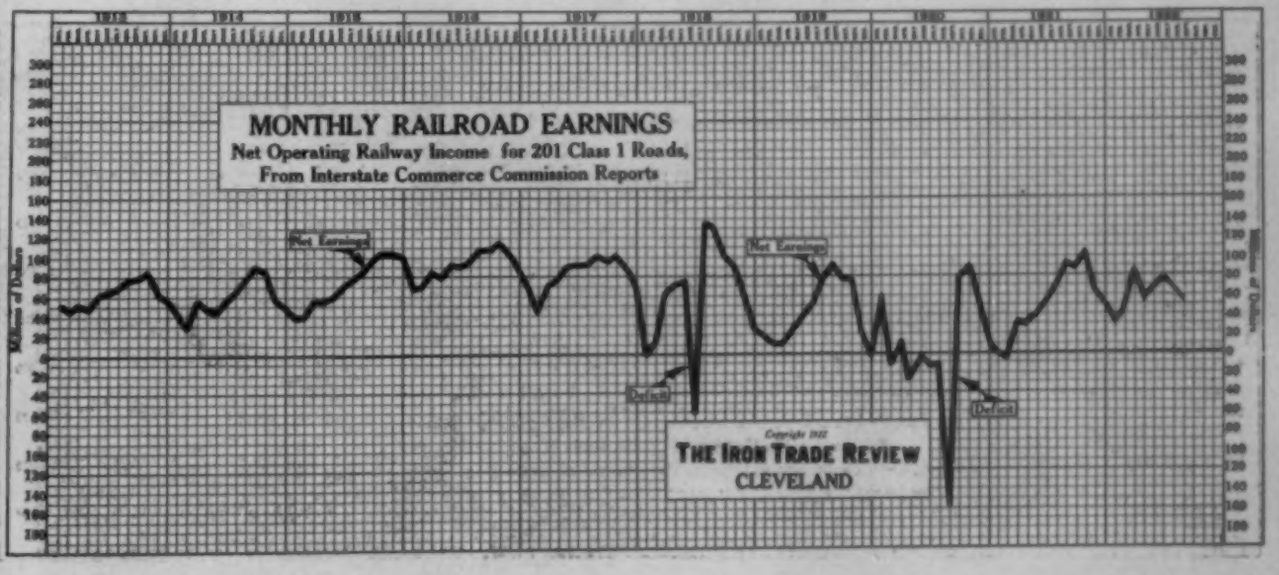
Cash Ratio Federal Reserve System
Open Market Interest Rate
Federal Reserve Rediscount Rate


MONTHLY RAILROAD EARNINGS
Net Operating Railway Income for 201 Class 1 Roads,
From Interstate Commerce Commission Reports
Net Earnings
Net Earnings
Deficit
Deficit
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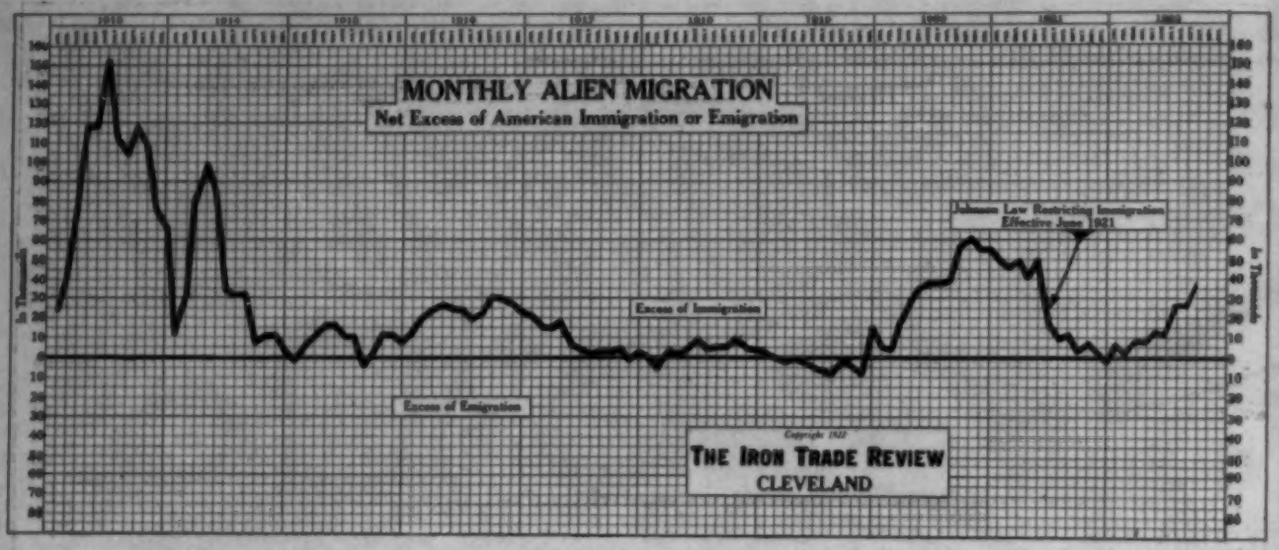
MONTHLY ALIEN MIGRATION
Net Excess of American Immigration or Emigration
Johnson Law Restricting Immigration Effective June 1921
Excess of Immigration
Excess of Emigration
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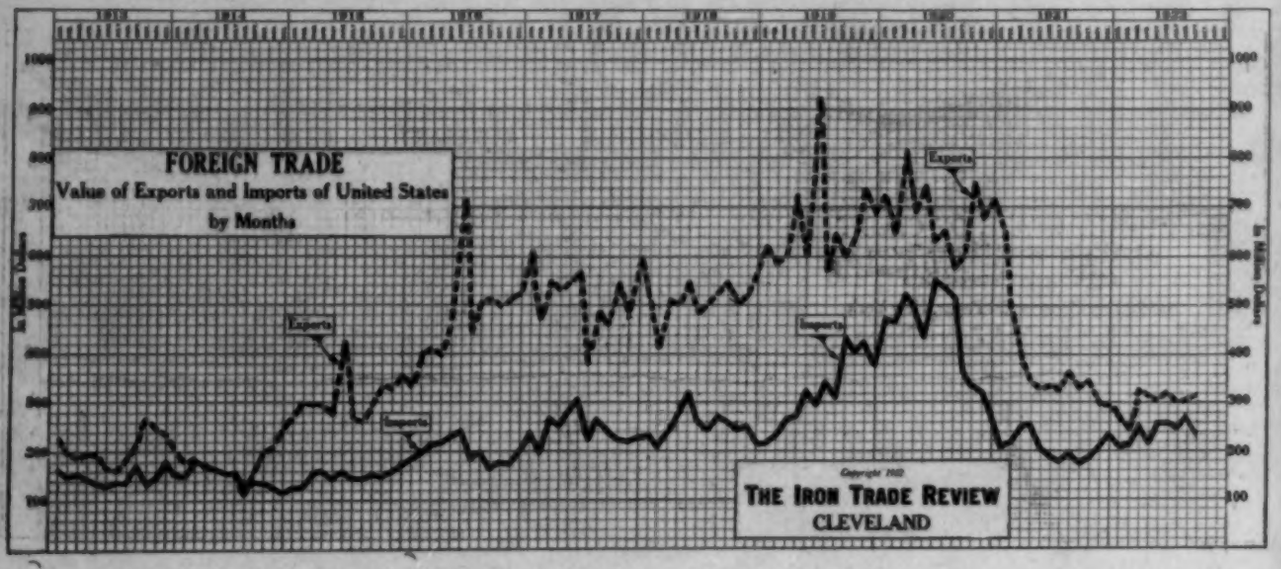
FOREIGN TRADE
Value of Exports and Imports of United States by Months
Exports
Imports
Exports
Imports
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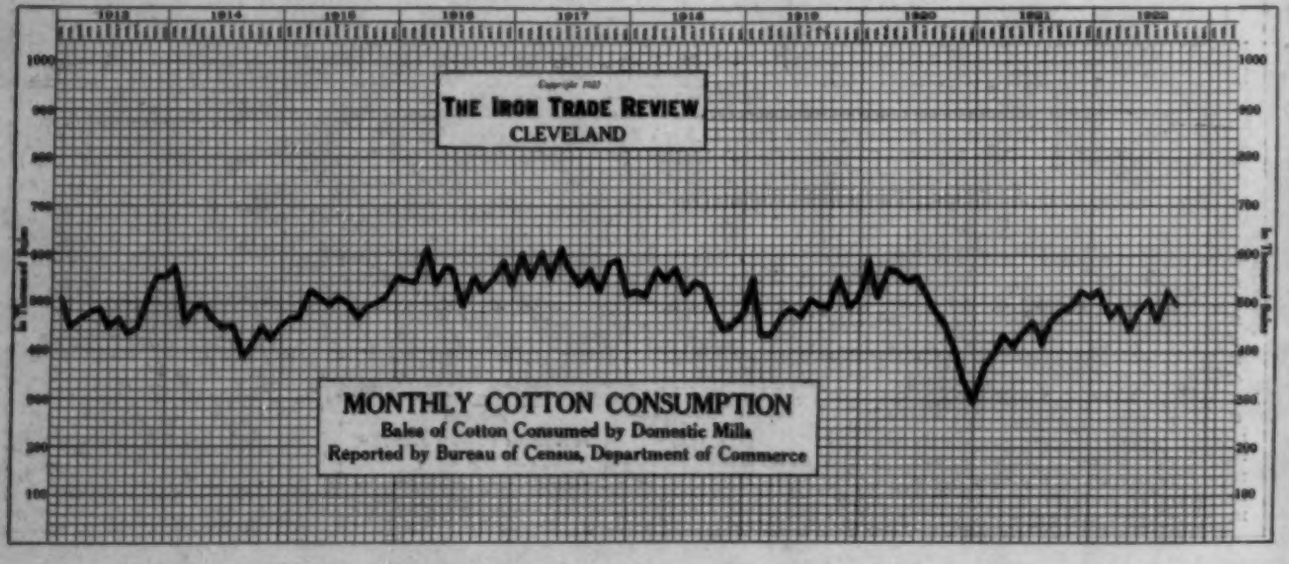
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MONTHLY COTTON CONSUMPTION
Bales of Cotton Consumed by Domestic Mills
Reported by Bureau of Census, Department of Commerce

Labor Shortages Present Problem

Increasing Lack of Adequate Labor Supply Is Obstacle for Long Continued Upturn in Business Activities—Immigration Restriction Cuts off Supply of Hand Workers—Credit Resources Ample

BY JOHN W. HILL, FINANCIAL EDITOR

ONE of the possible obstacles to long continued improvement in business is the growing shortage of labor. Usually a period of prosperity is terminated by the exhaustion of credit resources due to industrial expansion. The stupendous supply of credit which now exists is sufficient to support all reasonable growth of trade activities for a long time to come. This is made evident by the fact that last week, although in the midst of fall trade, member banks of the federal reserve system reduced their borrowings from the system by $40,000,000.

As a consequence the federal reserve ratio of the system, as pictured in the State of Credit chart in the Business Trend Section, advanced over two points to 77.6 per cent. It is now not far from the highest of the year. Evidently its recent decline was largely due to preparations being made by banks to finance the $500,000,000 government bond issue. Total borrowings of the system are now only $87,000,000 more than they were in August, while note circulation is $142,000,000 more. This reflects somewhat greater commercial needs, but it also plainly shows the strong financial position of the banks in the country, which enables them to finance business without drawing heavily upon the credit reserves. The system's rediscounts now are 70 per cent below 1920.

All this makes it clear that there is little to fear from depletion of credit resources. With labor, however, there is a different story. From many authoritative sources come reports of inadequate labor supplies with predictions that the situation will continue to grow more acute. The reason for this is to be found in the immigration restriction laws. Under this law only 3 per cent of the number of foreign born persons of any nationality present in the United States in 1910 can enter in a year. This means about 350,000 annually against an average of 950,000 annually for five years preceding the war. As shown by the immigration chart in the Business Trend Section, net immigration fluctuates from month to month but the aggregate for the year is prescribed.

Formerly industry depended for its common labor supply upon immigration. It is the cutting off of this supply and the unwillingness of Americans to perform manual work which makes the situation serious Labor saving machinery is helping solve the problem but needs are pressing. The danger lies in the constant upbidding of wages until costs have been advanced to a point where business at a profit will be rendered difficult. Relief from congress on the immigration question is hardly to be expected; in fact further restrictions are being contemplated.

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The Barometer of Business

WEEKLY COMPARISON

	Last week	Week before	One month ago	One year ago	1913
Business failures	357	442	380	437	356
Cash Ratio Fed. Res. System	77.6	75.5	78.4	70.8	.....
Loan rate, 4-6 months, N. Y. (per cent)	4½-4¾	4½-4¾	4½-4¾	5½-5¾	5½-5¾
Aver. 20 Ind'l. shares	$94.21	$97.19	$93.01	$70.97	$78.30
Aver. 20 Rail shares	$91.75	$93.09	$90.14	$72.61	$104.05
Aver. 40 bonds	$80.20	$80.62	$81.26	$71.42	$93.00
Car loadings (week ended Oct. 14)	983,470	968,169	945,919	910,529	*1,018,539
Bank debits 165 cities (000 omitted)	$9,564,452	$9,865,022	$8,224,263	$7,606,379	.....

*1920.

FOREIGN EXCHANGE (Demand)

	Normal	Oct. 31 (close)	Week before	Month ago	Year ago
Sterling	$4.86	$4.45½	$4.44	$4.39½	$3.93
Francs	19.3c	6.94½c	7.12½c	7.57½c	7.30c
Lira	19.3c	3.99½c	4.11½c	4.27c	4.00c
Marks	23.8c	0.02¼c	0.02⅞c	0.05⅛c	0.57c

MONTHLY COMPARISON

	September	Month before	Year ago	Monthly average 1913
Dodge building awards in 27 states	$271,491,000	$322,007,000	$246,186,000	$71,450,000
Business failures:				
Number	1566	1714	1446	1336
Liabilities	$36,909,157	$40,279,718	$37,021,000	$22,723,000
Excess of exports	$85,000,000	$31,000,000	$146,490,953	$54,406,000
Excess of gold imports	$27,602,000	$18,136,355	$63,636,512	*$630,716
Bureau of Labor Price Index	153	155	141	100
Bradstreet's Price Index	155.6	154.3	164.8	100
Economist's British Price Index	4189	4257	4924	2717
Cost of Living Index	155.6	154.5	164.8	100
New incorporations	$664,000,000	$646,605,000	$498,846,000	$172,301,000
Railroad net earnings	†$53,000,000	$69,239,000	$90,240,000	$39,900,000

†August. *Monthly average export excess.

British Sales to America Subside

Foreign Producers Report New Demand from United States Is Dull—Change in British Government Considered Favorable to General Business Conditions—German Prices Advance Drastically

The Iron Trade Review Staff Cable

European Headquarters,
IRON TRADE REVIEW,
2-3 Caxton House, Westminster, S. W.1

Sterling—$4.46

LONDON, Oct 30.—Observers in the iron and steel trade of Great Britain believe that the recent change in the British government will be favorable to business.

A small cargo of Luxemburg foundry pig iron has been sold for delivery to the United States at £4 1s 6d ($18.17), f.o.b. Antwerp, but American business generally at present is dull. British producers are exporting considerable tonnage of pig iron to other than American destinations, including 1500 tons just shipped to Antwerp by the United Steel companies.

The French are reorganizing the Comptoir Longwy to stimulate exports of pig iron. German prices have been advanced drastically again but not yet sufficient to cover the slump in the mark.

British steelmakers hope for a slight improvement in their business as a consequence of increased merchant and naval shipbuilding. Lower continental exchanges have resulted in reductions of an average of 5 shillings ($1.11) on export prices of British finished steel products.

Belgians are selling 2-inch billets at £5 10s ($24.53) and beams at £6 10s ($28.99). Luxemburg has sold several thousand sheets bars at £6 2s 6d ($27.31), and Germany a considerable tonnage of iron rods at £7 15s ($34.56). All of the foregoing prices are f.o.b. Antwerp.

France's Export Business Flourishing

European Staff Special

Office of IRON TRADE REVIEW,
224 Rue de Rivoli,

Franc—$0.075

PARIS, Oct. 20.—The situation of the French iron and steel market continues satisfactory, although the volume of new inquiries and orders has decreased during the last few days. The market appears to be stabilizing, while production is gradually increasing. August production shows an increase of about 25,000 tons of pig iron, and 35,000 tons of steel over July figures. Export business is flourishing, especially in semifinished products.

A further readjustment of coefficients on tariffs is being studied at the ministry of commerce. The new coefficients suggested by the customs administration have been submitted to the different groups representing iron and steel interests in order that a solution may be arrived at.

The Pont-a-Mousson works have been awarded an order for 9000 tons of tubes for Argentina. English prices were 10 per cent higher than that offered by the French firm, and German prices were higher still.

Coke deliveries were more satisfactory during September, reaching the figure of 365,000 tons, 89 per cent of the amount fixed by the reparations committee.

Pig iron quotations have gone up, the price of 235 francs ($17.60) per metric ton having been reached for foundry chill-cast No. 3. The average price, however, ranges from 225 francs ($16.85) to 230 francs ($17.15). The hematite department is progressing and prices are firm. Inquiries are coming in from America and Switzerland while one furnace in the South sold 1000 tons to Italy.

The demand for semifinished steel is good, prices are firm. Basic bessemer ingots are quoted 310 francs ($23.25) per metric ton. The rail department is less flourishing. Light sections can be obtained from numerous stocks coming from the war regions, this material still being in good condition. However, a few orders have been obtained by Lorraine mills at 400 francs ($30.00) per metric ton. The railway companies are only ordering enough standard rails to cover their requirements during the next three or four months.

Demand for beams and structural steel is considerable. In some cases deliveries are extended until January. Steel merchants are depleting their stocks. It is possible that the price of 475 francs ($35.55) for normal beams will be increased before long.

The price of merchant bars seems to have reached its highest point. One Lorraine mill has quoted 450 francs ($33.75) per metric ton, but the average is around 445 francs ($33.25). The plate and sheet department is satisfactory.

Japan Plans To Buy More Ship Plates

Foreign Special Service

Czech Crown—$0.0313

TOKIO, Japan, Oct. 20.—Fall activity in the Japanese iron and steel trade is not developing as usual, and the market continues very much depressed, with prices unsteady and tending downward. Steel manufacturers and traders are taking a hopeful view of the situation as a result of the government's plan for saving the shipbuilding industry from decadence resulting from the situation in the freight market and the naval holiday. The government has announced its intention to advance to shipbuilders funds at low interest rates for the building of freighters and passenger boats, which are to be superior to any now under the Japanese flag. In the opinion of the government officials this will enable the shipyards to maintain operations. It is estimated that 30,000 tons of ship plates in addition to requirements already covered will be purchased, either in this country or abroad. If the additional requirements are to be covered in this country the government steelworks will not be compelled to make additional readjustments in working conditions which have been contemplated.

A decrease is noted in visible stocks of some classifications of finished steel, but the stocks of shapes and plates have increased, as has the supply of nails. Flat and square bars are entirely out of demand and holders who are unable to have their bank loans renewed are making sacrifices to dispose of the material. Round bars are quoted at 4.60 yen ($2.20) per 10 kwamme (82.67 pounds); flat and square bars are 4.60 to 4.70 yen ($2.20 to $2.26); plates are 4.20 yen ($2.01) and sheets 6.70 yen ($3.21) per 10 kwamme.

In the pig iron market there is a moderate demand for small lots. Cotton mill equipment makers are affected by a downward trend in the cotton yarn

Current Iron and Steel Prices of Europe

British Market

Home Market Prices. Gross Tons at Works or Furnace.

Corrected to Date by Cable

	$	£ s d
SEMIFINISHED STEEL		
Billets, soft steel	27.82	6 5 0
Sheet bars	27.82	6 5 0
Wire rods	40.05	9 0 0
FINISHED STEEL		
Steel bars, England, ½ to 3-inch	36.72	8 5 0
Steel bars, England, ½ to 3-inch, for export	35.60	8 0 0
Plates, ship, bridge and tank, England	37.83	8 10 0
Plates, ship, bridge and tank, England, for export	36.16	8 2 6
Plates, ship, bridge and tank, Scotland	36.72	8 5 0
Plates, ship, bridge and tank, Scotland, for export	35.05	7 17 6
Beams, England	36.72	8 5 0
Beams, England, for export	34.50	7 15 0
Beams, Scotland	35.60	8 0 0
Beams, Scotland, for export	34.50	7 15 0
Sheets, black, 24 gage	45.62	10 5 0
Sheets, galvanized, 24 gage	73.43	16 10 0
Rails, 60 lbs. and over	35.60	8 0 0
Rails, 60 lbs. and over, for export	32.27	7 5 0
Tin plate, base box, 108 lbs.	4.30	0 19 3
Steel hoops	45.62	10 5 0
Steel hoops, for export	44.50	10 0 0
PIG IRON		
Hematite, East Coast, Mixed Numbers	20.59	4 12 6
Hematite, West Coast, Mixed Numbers	20.59	4 12 6
Basic Middlesbrough	17.80	4 0 0
No. 3 Foundry, Middlesbrough	20.59	4 12 6
No. 3 Foundry, Derby, Leicester, Nottingham	18.36	4 2 6
No. 3 Foundry, Northamptonshire	17.80	4 0 0
No. 3 Foundry, Staffordshire	17.80	4 0 0
No. 3 Foundry, Scotch	22.81	5 2 6
Ferromanganese, 76 to 80 per cent	66.75	15 0 0
Ferromanganese, 76 to 80 per cent, for export	62.30	14 5 0
COKE		
Yorkshire furnace	4.90	1 2 0
Yorkshire foundry	6.12	1 7 6

Where no separate export prices are given, same quotations apply to domestic and foreign business.

German Market

Prices Last Reported

	$	Marks per metric ton
PIG IRON		
Hematite, Oberhausen	7.62	38,099
Foundry, No. 3, Oberhausen	6.53	32,626
Bessemer Stahleisen, Siegen	6.30	31,497
Foundry, No. 1, Oberhausen	6.54	32,696
Luxenburg—Foundry	6.25	31,271
COKE		
Ruhr furnace	1.48	7405
Ruhr foundry	1.54	7702
SEMIFINISHED STEEL		
Billets	8.00	39,980
Sheet bars	8.60	42,940
Wire rods	8.34	41,715
FINISHED STEEL		
Standard rails	10.50	54,500
Merchant bars	9.91	49,540
Structural shapes	9.80	48,990
Ship plates	11.14	55,695
Medium plates, 3 to 5 millimeters	12.60	63,005
Sheets, below 3 millimeters	14.85	74,260
Tin plate	36.00	180,000
Plain wire	10.63	53,155
Bands and strips	11.56	57,775

All prices are f.o.b. furnace or mill.

French Market

Prices Last Reported

	$	Francs per metric ton (2205 lbs.)
PIG IRON		
Hematite, Lorraine	20.85	300
Basic Bessemer, Lorraine	15.99	230
Foundry, Longwy, No. 3, sand-cast	15.99	230
Foundry, Longwy, No. 3, chill-cast	15.99	230
Ferromanganese, 76 to 80 per cent	65.68	945
COKE		
French furnace	6.60	95
German furnace, f.o.b. frontier	6.60	95
French foundry	8.62	124
SEMIFINISHED STEEL		
Blooms	22.59	325
Billets	23.98	345
Sheet bars	27.45	395
FINISHED STEEL		
Standard rails	38.23	550
Merchant bars	31.62	455
Angles	33.01	475
Normal beams and profiles	33.01	475
Plates, ship and tank, 10 millimeters and thicker	42.40	610
Plates, bridge and tank, 5 to 10 millimeters	45.18	650
Sheets, black, 3 millimeters	50.74	730
Sheets, blue annealed, 2 millimeters	64.64	930
Shafting, cold-drawn, 40 to 60 millimeters	58.18	850
Bars, 2 per cent nickel steel	76.45	1100

All prices are f.o.b. furnace or works.

Belgian Market

Prices Last Reported

	$	Francs per metric ton (2205 lbs.)
PIG IRON		
Basic bessemer, Belgian	14.54	225
Basic open-hearth, Belgian	15.18	235
Gray forge, Belgian	14.86	230
Foundry, No. 3, Belgian	16.47	255
Foundry, No. 3, Luxemburg	16.47	255
Foundry, No. 3, Lorraine	16.47	255
SEMIFINISHED STEEL		
Blooms	21.00	325
Billets	21.96	340
Sheet bars	22.93	355
Wire rods	32.30	500
FINISHED MATERIAL		
Standard rails	27.46	425
Merchant bars	27.78	430
Normal beams and profiles	26.49	410
Plates, 5 millimeters and thicker	31.01	480
Sheets, black, 3 millimeters	33.92	525
Sheets, galvanized, 1 millimeter	93.02	1440
Plain wire	41.67	645
Galvanized wire	57.49	890
Wire nails	32.62	505

All prices are f.o.b. furnace or works.

trade and textile industry, and they are not buying iron. The market is unstable and prices are freely shaded. No. 1 Japanese iron is quoted 67 yen ($32.16) per ton, and No. 2 62 yen ($29.76). No. 1 Hanyang (Chinese) iron is quoted 65 yen ($31.20); No. 3 Cleveland 70 yen ($33.60) and Indian (Tata) 55 to 58 yen ($26.40 to $27.84).

Brazil and Argentina Purchase Rails

European Staff Special

BRUSSELS, Oct. 20.—Although the Belgian iron and steel market continues to show signs of activity, the general impression is one of uncertainty and it is felt that business has reached its climax for some time. Production is not far from normal and books are well filled with orders, but buyers have taken care of their requirements and seem to be holding back. Producers still face labor difficulties.

In the export trade, Germany has come to the front in China where America also is a competitor. Lor-

Franc—0.07

raine and Luxemburg are to be met on foreign markets. An order for 75,000 tons of rails for Brazil has been divided as follows: 30,000 tons to Luxemburg and 45,000 tons to Belgium (Sambre-et-Moselle 30,000 and Providence 15,000). The remainder of the order, 25,000 tons, has not been awarded. Sambre-et-Moselle also has obtained 9000 tons of rails for Argentina. These orders include about 10,000 tons of bolts and accessories.

The Societe of Thy-le-Chateau and the Metallurgique du Hainaut have each blown in a new furnace. Ougree-Marihaye have completed a power house for the use of pulverized coal. The Usines Metallurgiques du Hainaut have closed their plate and sheet mills at la Louviere.

Pig iron quotations are rising while stocks are depleted owing to renewed activities in steel plants. The demand for foundry iron for export is

(*Concluded on Page* 1220)

Steelmakers Voice Cheerfulness

American Iron and Steel Institute Meeting Marked by Faith in Future Conditions Despite Obstructing Factors—Report on 12-Hour Day Not Yet Compiled—1300 Present at Sessions and Banquet

PRESSING problems of industry today and of the nation at large including those of international relationships were brought clearly into view at the twenty-second general meeting of the American Iron and Steel institute at the Hotel Commodore, New York, Oct. 27, which was attended by 1300 manufacturers of iron and steel and related lines.

Judge Gary as usual gave the commanding note to the meeting in his address introductory to the sessions. He covered economic, legislative and political matters in the broadest fashion and emphasized the inviolability in business and common life of such fundamental laws as that of supply and demand. His analysis of business conditions and outlook was hopeful and soundly optimistic, holding the continued prosperity wholly was within the hands of the people of the United States themselves in view of the great resources and accumulated needs.

The question of the 8-hour day in the steel industry was introduced by Judge Gary into the session. He announced that the committees working on this subject had not been able to formulate their report because the complete data had not yet been secured. He urged upon the iron and steel makers to make their returns to the committees at the earliest possible moment so that the request of the President that this question be earnestly considered be speedily complied with.

Commercial and Technical Subjects Discussed

TAXING the capacity of the vast ball room at the Commodore hotel, the banquet on Friday night attracted an attendance of over 1400. Judge Gary as usual presided. He referred to "our old, beloved friend, Uncle Joe Butler, who is still ill, but is recovering. He is in good spirits, able to be about and has promise of life for many years to come." Judge Gary also referred to "our old and admired friend, Mr. Willis King, who has been ill and is unable to be here, but who is improving." Judge Gary felicitated the members on the success of the institute and on the loyalty and high principles that make it possible to maintain the organization on its high plane. He reminded those present that Friday was not only the day of the institute meeting, but also the birthday of Theodore Roosevelt and hence, Navy Day. Therefore, he said, he has invited Admiral C. T. Vogelgesang as one of the speakers of the evening.

Admiral Vogelgesang presented a forceful address in which he told of the relation of the navy to the general economic life and particularly the steel industry of the country. He quoted the words of Andrew Carnegie that the steel industry was built up on the navy. The recent Washington disarmament conference, he said, has acted as a stimulus to fanatical pacifists who believe that the danger of war is over. These pacifists are numerous, he said and dangerous. There is no such thing, said the admiral, as a panacea to prevent war. War is an outgrowth of the desire to progress. Competition between the nations at first is characterized by amity, but a nation, if it will survive, must be productive and progressive, and as the productivity of nations increases the competition becomes keener. War, said he, is the ultimate expression of economic life. The United States has producing power about 20 per cent in excess of its power to absorb and we are coming in competition in the foreign markets with other nations who are equally dependent on the foreign trade. These other nations as a result of years of development are entrenched in the foreign markets and they will not tamely submit to our competition. The navy, he said, is the bulwark of defense for the maintenance of those economic factors which the navy defends.

"Make effective your protest," said the admiral, "against a budget, which, as in the last year, has not been sufficient for proper maintenance or expansion of the fleet, and which has refused to give us the men we know we need. A cheap navy is an unjustifiable expense because it is not effective. Our navy must be the best. It takes only 8 per cent of the national budget."

To demonstrate that the navy is a good investment, Admiral Vogelgesang quoted figures comparing the cost of maintaining the navy, with the figures representing our export business. He declared that as the United States becomes more progressive and prosperous the navy is going to become infinitely more useful to the country. Admiral Vogelgesang told how the needs of the navy have stimulated industrial development in this country and particularly in the steel industry, which constantly has been forced to improve its methods in order to meet the increasingly exacting specifications of the navy. Naval requirements, he said, give a greater stimulus to industry, than does private business. He told of the extensive requirements of the navy covering armor plate, the electrical field and in fact all divisions of industry. In each industry the standards are raised constantly due to the necessity of meeting new naval specifications. He pointed to the radio as an instance of the part played by the navy in fostering progress.

Charles M. Schwab, in a characteristic address, explained why he had not been able to attend the institute's meeting at New York last spring. At that time, he said, there were hearings at New York, at which the leading men in the steel industry which were available in New York, were examined.

"I decided," said Mr. Schwab facetiously, "that the air in the Alleghany

mountains would be more beneficial to me than that in New York. All the preponderance of evidence in fact, was that I should stay in the Alleghanies. Incidentally, I read in the newspapers, about what Gary, Topping, Grace, Clark, Dinkey and the others were saying at these hearings. It seemed that all of them knew absolutely nothing about the steel business. I was ashamed of them."

In introducing Mr. Schwab, Judge Gary paid him a tribute upon his loyalty, friendship and on the constant dependence that the institute has been able to place upon him. Judge Gary referred to Mr. Schwab's distinguished accomplishments. Mr. Schwab reciprocated these sentiments and spoke of the great benefits from Judge Gary's work for the steel industry. "We shall stand by him and with him. Long live the president of this institute," said Mr. Schwab and the applause which followed effectively demonstrated the feeling of affection and devotion which the leaders of the steel industry generally hold toward Judge Gary.

Mr. Schwab said he well remembered producing boiler plate for the government at Homestead in 1882. "Admiral Vogelgesang just has spoken of the high quality he got," said Mr. Schwab. "I can speak of the high quality that he thought he got." Nevertheless," said Mr. Schwab, "there is no element that has contributed more toward the upbuilding of the quality of steel than the naval specifications." Mr. Schwab then spoke optimistically of the future of the steel industry. Enough business will be available to keep the steel industry of the country busy, he said, and new plants are going to be built to increase capacity and the steel industry of the country will continue to grow and progress in the future as it has in the past.

Dwight M. Morrow, partner in J. P. Morgan Co. spoke of the tremendous progress in industry over the past 100 to 150 years. That long ago, he said, people produced, or had produced for them by other people, living nearby, the materials they needed in their daily life. Now, the materials of life are produced in tremendous volume by workers who have absolutely no idea of the identity of the consumers of them. He congratulated the iron and steel industry on the progress that it has made.

Directors of the institute, at their meeting Friday noon, elected Willis F. McCook, president of the Pittsburgh Steel Co. as a director of the institute. Mr. McCook takes the place of George F. Downs, who resigned as the president of the Lackawanna Steel Co.

Wrote Speech at Night

I WROTE my address between the hours of 12 midnight and 3 o'clock in the morning two weeks ago," said Judge Gary in his introductory remarks preceding his address as president of the institute. "Sometimes I find I cannot sleep. On such occasions I usually take up a subject and think it out; then I find I don't know anything for I fall asleep. I suppose none of you are troubled with sleeplessness. If you are, however, you will find this a helpful way of overcoming it."

Before reading his prepared address in opening the morning meeting Judge Gary made some extemporaneous remarks on various subjects. No report on the investigation of the 12-hour day by the iron and steel industry yet was ready, he said. "I very much regret that this is the condition," said Judge Gary. "I am going to urge all those interested in this subject to furnish to the committees and special subcommittees all the information asked for at the earliest possible moment. I urge that no manufacturer neglect this as the inquiry is very necessary and very important. It is one of the biggest questions ever brought before the iron and steel industry. Considering the fact that the President of the United States has asked us to take up this matter and is very earnest, fair and reasonable about it, and considering the great burdens under which he labors today we ought to do everything we can to assist him in everything he undertakes. This meeting is another demonstration of the popularity of the American Iron and Steel institute. There are many reasons for this. This is a good time for the iron and steel producers to get together for the discussion of any and all problems affecting themselves as well as the country at large."

The program of technical papers of the meeting was somewhat longer than usual but was presented with dispatch. "Modern Methods of Mining Coal" was presented by H. Foster Bain, director, bureau of mines, Washington. In connection with this paper the bureau of mines' reel on "The Story of Coal" showing the operation of mining, both above and below ground was run off. Other papers at the morning session included "The Storage of Bituminous Coal" by H. H. Stoek, professor of mining engineering, University of Illinois, Urbana, Ill., and by J. V. Freeman, director of coal and coke research laboratory, United States Steel Corp., Joliet, Ill.; "The Present Status of the Electric Furnace in Refining Iron and Steel" by Dr. J. A. Mathews, president, Crucible Steel Co. of America, New York; and the "Economic Importance of the Power Plant in the Steel Industry" by E. F. Entwistle, assistant general manager of the Steelton plant, Bethlehem Steel Corp., Steelton, Pa. The Entwistle paper was discussed by F. L. Collins, electrical department of the Gary works of the Illinois Steel Co.

The afternoon session included the following papers: "The Steel Requirements of the Automotive Industry" by Henry Chandler, metallurgist, C. H. Wills & Co., Marysville, Mich.; "Heating Furnaces for Blooms, Slabs and Billets" by W. P. Chandler Jr., fuel and experimental engineer, Carnegie Steel Co., Duquesne, Pa., which was discussed by Prof. Willibald Trinks, Carnegie Steel Institute of Technology, Pittsburgh, and W. B. Chapman, Chapman Engineering Co., New York; "Use of Liquid Fuel in Metallurgical Furnaces" by R. C. Helm, director, physical laboratory, American Steel & Wire Co., Worcester, Mass., which was discussed by J. A. Larocca, combustion engineer, Texas Co., New York; "The Thermal Efficiency and Heat Balance of an Open-Hearth Furnace" by C. L. Kinney Jr., superintendent, No. 1 open-hearth department, South Chicago works, Illinois Steel Co., South Chicago, Ill., and G. R. McDermott, assistant chief engineer, South Chicago Works, Illinois Steel Co., South Chicago, Ill., which was discussed by S. S. Ball, open-hearth superintendent of the Bethlehem Steel Co.; and "Fluorspar and Its Uses" by G. H. Jones, president, Hillside Fluorspar Mines, Chicago, Ill.

Foundries in Association

The Quad City Foundrymen's association has been organized at Moline, Ill., by representatives of 27 foundries, including gray iron, malleable, steel, brass and aluminum. At the second meeting, Oct. 16 the first after the organization was completed, Dr. Richard Moldenke addressed the club on general foundry practice, followed by discussion. The club includes various foundry representatives, managers, general superintendents, foremen, engineers, chemists, pattern makers, and the like. The club has elected A. E. Hageboeck, president, John Ploehn vice president and R. L. Van Alstyne secretary and treasurer.

Supply and Demand Must Prevail

Interference with This Inexorable Law by Combinations, Legislation or Individual Action Brings Injustice and Distress to Public—Immigration Laws Must Be Liberalized —Foreign Debts Should Be Paid—Prosperity Within Our Control

BY E. H. GARY

WHAT is to be said on this occasion relates to economics; and it will be spoken from the standpoint of the public interest. Our business life is represented by various groups of men and women and involves a great diversity of economic activities. Taken alone, each branch of industry is naturally selfish and influenced more or less by unworthy motives. In discussing any particular one, all others must be considered as a part of the general public. If in management any wrong or injustice is perpetrated, it is the general public which must finally in some way suffer the consequences.

Therefore in the consideration of all economic questions every one should endeavor to determine the final effect upon the people as a whole. Personal or private gain or advancement or political advantage must be subordinated to the general public good.

As industry has developed, populations multiplied and wealth increased, the problems and difficulties in economic life have grown and we have been correspondingly forced to concentrate our minds upon proposed measures for relief or protection against imposition.

The greatest of all wars has very much complicated the situation, even in this country. Our recent industrial strife, the present pending agitation for the creation of an organization of classes calculated to secure power and benefit by physical force under the leadership of vicious men, with which you are more or less familiar, the profiteering that still exists, if in a lesser degree than formerly, are temporary relapses, so to speak, of the war fever, during a prolonged period of convalescence.

We are still suffering from the very high cost of living caused by the despicable cycle, developed during the war, which carries high prices from a starting point in a given place, proceeds around a spiral and returns step by step to a higher basis. Speaking generally and yet making the illustration specific, labor, which constitutes 85 per cent of the cost of production, is paid very large rates, but, with exceptions, is not paid more than is proper, because compelled to pay high prices for the living costs. Normal conditions have not been fully restored and apparently are not likely to be in the immediate future, unless extraordinary efforts shall be made.

We are apt to conclude that everything objectionable can be overcome by the adoption, amendment or repeal of laws. But on reflection one possessed with average intelligence and information, knows this is a fallacy. Many laws have been passed which are improper, and no doubt new ones ought to be enacted, all bearing upon economic questions. This will always be the case.

It is the purpose at this time to refer briefly to certain old and fundamental principles, which in modern times have been by large numbers overlooked or at least underestimated. Reference is made to the law of supply and demand. This law is inexorable.

It might as well be admitted first as last by every individual, collection of persons, or nation, that in order to obtain what is desired, there must be rendered an equivalent value, and that if secured on any other basis the business will not be satisfactory. What amounts to an equivalent or fair consideration in any transaction is, of course, mutually determined by the parties concerned, and if each agrees freely and voluntarily with full knowledge of the facts, uninfluenced by coercion, action is and should be final.

When an individual or association of individuals can and does collect an unconscionable amount for a commodity or for work, as the result of any circumstance or combination, the general public must and does finally pay the bill. This is inevitable and it is a pity that large portions of the public overlook or ignore this fact.

When we ponder over the situation with the idea of suggesting a remedy, the first question presented relates to combinations or conspiracies to suppress natural laws. If one is actuated by motives of cupidity or dishonesty, one is apt to suppress and then oppress. A combination calculated to control business or production either as to quantities or prices, by the employers or by the employes, interferes with the natural course of business and results in hardship upon all who are outside the combination, who may be termed the consumers.

In this connection another question is presented, namely, how are we to distinguish meritorious from vicious legislation, presumably intended to prevent oppression? Any statute that unnecessarily interferes with the natural law of supply and demand works incalculable damage to economic progress and prosperity, and is disastrous to the general public or to a nation.

From what has already been said you are probably at least mentally inquiring, what is to be done? What is now proposed? How can business be done with fairness and with justice, except by the adoption and enforcement of laws which absolutely control business as to prices, rates, deliveries and all other particulars, and which secure proper treatment of every one, even though this would necessarily interfere with full, free and unlimited action on the part of all different groups in the advancement of their own interests respectively?

Every one should attempt to answer these questions for himself or herself. A proper answer would be that the natural law of supply and demand should not be interfered with by the government or by any administrator of the laws, except in cases of turpitude, and this applies to all business transactions. There are already too many man-made laws, and perhaps too many attempts to apply them, which are calculated to interrupt and hinder progress and industrial prosperity.

We have not fully appraised the value

Favors New Conference

IT IS to be hoped there will soon be held in Washington another peace conference for the full and frank discussion of all unsettled financial, commercial and industrial questions in which our people are interested, directly or indirectly, to be participated in by able, open-minded, well-disposed representatives from the different nations. If there shall be such a meeting, and the delegates are all of the type referred to, there will result incalculable good to all. They would not decide or discuss how to abolish or overcome the old established law of supply and demand, how to avoid or repudiate existing legal obligations, but rather how and when to fulfill them without irreparable injury to anyone or the sacrifice of principle.—E. H. GARY.

Presidential address before the American Iron and Steel Institute, New York, Oct. 27.

of publicity. Its practical results and its necessities in all departments of economic life without discrimination or exception have not been given due consideration. The full exposure to the people of business methods and management on the part of public and private institutions and organizations will create and firmly establish a powerful, effective and satisfactory public sentiment, which, on the average and for the long run, will be more potential than penal statutes.

All inquiries for the benefit of the public concerning private affairs, to be effective, must be made with strict honesty and impartiality. When the public is constantly given all proper information concerning business, after ascertained honestly, impartially and intelligently by a government board of undoubted ability, nonpartisan in character and including every branch of industry without exception, the public interest will be protected and not before.

We have been passing through an industrial conflict, involving commission of crime, heavy losses in commerce and industry, both to capital and labor, and deprivations to the general public which reached almost to the brink of extreme suffering and death, carried on by one side whose methods and amount of money expended, or the purpose of the same, were not exposed to the public view.

There is nothing to be said at this time against labor organizations or their leaders; certainly there is or should be no personal animosity. But to permit any group, and this representing only a minority in its branch of industry, to be exempted from publicity, is an injustice and a wrong to the general public.

It goes without question that in business there are numerous matters relating to operation and management which are of interest only to the persons or concern connected, and these need not and should not be divulged to the general public, some of them particularly before consummation of pending negotiations; but as to the matters which at the time affect the public welfare there should be the right to have inspection by a competent, disinterested and nonpartisan body. Let us demand in this country full, fair, impartial, competent publicity, applied without fear, favor or discrimination.

The steel industry should and would welcome such a condition. It was proved to be desirable and proper during the panic of 1907 and a short period succeeding. It is true, complaint was made by a partisan congressional committee in regard to the addresses made at the meetings, notwithstanding they were all recorded and reported to the law department and other departments in Washington; but the courts held they were proper and highly advantageous to the public though they also held, as they ought, that what followed months later on the part of a few individuals was objectionable. There is no good reason why the public, through proper agencies, should not be present at private meetings of groups. It is, however, wrong to treat any branch of industry differently from all others. Of especial interest just now is the treatment, with like rules, privileges and penalties of both employers and employes. Unless and until that is brought about there can never be industrial peace nor can the public interest be protected.

Must Free Development

THE utilization of the great wealth, natural resources and productive capacity of this country should be permitted without interruption or hindrance up to the limit of propriety. But how shall this be accomplished since laws and their enforcement provide the only absolute rule for the conduct of persons? The answer is, by the enforcement of all those laws which establish order and safety of person and property as against riot, physical force and intimidation; enactments or amendments which permit immigration of foreigners on the basis of quality rather than numbers; and new laws or amendments which permit and require full publicity of economic transactions so far as they affect the public welfare.—E. H. GARY.

Foreign Debts Should Be Paid

The doctrine of supply and demand, which is one of mutuality, is germane to the present public and private discussions relating to the enormous debts owing by certain foreign nations to the United States. They were voluntarily, openly and fairly contracted. They cannot properly be canceled or disposed of on any other basis, without doing violence to well-recognized principles of justice and rules of propriety. To cancel these debts or any part of them without full payment would be forced charity, and that is never agreeable to the donor and, as a rule, equally disagreeable to a self-respecting person or nation.

In the judgment of many of us the foreign nations can and are willing to pay their debts, some sooner than others, and most of them sooner than is now generally admitted. This we have publicly asserted several times. We know something of their capacity to work and earn and save and thrive; of their success in business and their mode of living.

But there is no "royal road" to success. There is no way of paying debts, of receiving benefits, of acquiring property, of securing and retaining positions of employment or office, public or private, or obtaining assistants or workmen, skilled or unskilled, except on the basis of reciprocity, of returning fair equivalent to be mutually agreed upon. Every man or nation in order to measure up to obligations must work, and save; must be prudent and fair and economical.

All this applies to the payment of debts, to the re-establishment and progress of business, to the money rates of exchange, to the financial and other exchanges of commodities or activities.

The world, now more than ever before, needs peace, international and domestic, political, social and industrial. It is a time for work, economy, saving, thrift; honest, reasonable and intelligent recognition, observance and enforcement of the rules of law, propriety and common sense. Gentlemen, what we preach let us practice, conscientiously, persistently and loyally. Let us always transact our business on the basis of rendering a full equivalent for what we demand or receive. Thus we shall best succeed and prosper.

There are no obstacles to continued prosperity in the iron and steel business of the United States except such as may arise from interference with the natural course of supply and demand. There is a great abundance of high quality iron ore; steam, gas and coking coal; limestone and other raw products, all within easy reach; also furnaces, mills and shops of highest grades, railroads and ships for transportation, every variety of experts of pronounced ability, organizations and systems equal to any in the world; and the demand for every kind and character of steel is far in excess of capacity to produce. Steel is needed immediately for buildings and other structures, for railroads, for farms, for pipe lines, for canning, for equipment of every kind, for guns, tools and implements of thousands of varieties, for wire, ranging from the finest watch springs and piano strings to the largest cables, for cars, automobiles, airplanes and other vehicles for transportation of property and persons, and many other purposes.

Order books are well filled, finished steel, aggregating many thousand tons, is stored at the producing mills, ready for shipment, and this notwithstanding the recent labor troubles at the mines and in transportation circles. Unfortunately there has been an interference with the mining and delivery of coal and with the transportation of finished iron and steel, and there is an insufficient supply of labor.

If the natural course of business had not been interrupted we would now be enjoying success and prosperity in our industry greater than ever before, so far

(*Concluded on Page* 1216)

Discuss Engineering Problems at Institute Meeting

EDWARD F. ENTWISLE

EDWARD F. ENTWISLE was graduated from Cornell university in 1906. He started with Ford, Bacon & Davis, New York, on power plant construction at Nashville, Tenn., remaining until October, 1907, when he joined the Carnegie Steel Co. at its Duquesne plant. For two years he was in the mechanical and steam engineering departments. In 1914 he resigned his position to go with the Maryland Steel Co. at Sparrow's Point, as mechanical engineer. Upon acquisition of that company in 1916 by the Bethlehem Steel Co. he was made mechanical engineer of the Steelton plant. During last half of 1917 Mr. Entwisle was general superintendent of the Donaghmore division, which comprises Bethlehem's ore concentrating and blast furnace operations at Lebanon. In 1918 was returned to Steelton as assistant general manager.

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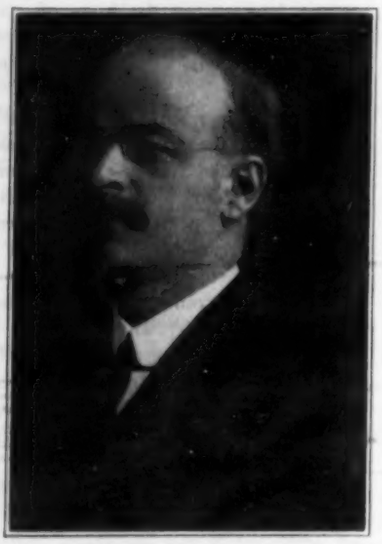

C. L. KINNEY JR.

HERBERT JONES, president of the Hillside Fluor Spar Mines, Chicago, retired as vice president of the Inland Steel Co., Chicago, a year ago after 28 years service in charge of sales. He is one of the founders of the Inland Steel Co. He left the company to devote his time to fluorspar development at Rosiview, Ill., but retains an interest in the steel company. His activities with Inland were always in sales.

* * *

R. McDERMOTT, assistant engineer of the Illinois Steel Co., South Chicago, was born in Glasgow, Scotland. He received his degree as mechanical engineer from Sibley college, Cornell university, in 1905. He then became associated with the General Electric Co. in its steam turbine engineering department. He returned to Cornell two years later for post graduate work, acting as assistant professor of thermodynamics as applied to heat and power engineering for a year and a half. Next he entered the employ of Westinghouse, Church, Kerr & Co., now Dwight P. Robinson & Co., and the New England Engineering Co. as superintendent of construction. In 1913, he took a position in the engineering department of the Illinois Steel Co.

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G. R. McDERMOTT

HENRY T. CHANDLER, metallurgist for the past two years with C. H. Wills & Co., Marysville, Mich, automobile builders, was born in 1890. He spent two years in the University of California, three years at the Massachusetts Institute of Technology, one year at the Sonbonne in Paris and 1½ years at the Polytechnic institute, Zurich, Switzerland, specializing in physics, chemistry and mathematics. Before going with the Wills company, Mr. Chandler was with the Ford Motor Co.

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HARRY HARKNESS STOEK, professor and head of the department of mining engineering at the University of Illinois, was born in Washington, Jan. 16, 1866. He was graduated from Lehigh university in 1887 and again in 1888, the last as engineer of mines. He immediately became assistant engineer of the Susquehanna Coal Co. and from January, 1900, to June, 1903, was instructor of mining, metallurgy and geology at Lehigh. Then for five years he was assistant professor of mining and metallurgy at Pennsylvania State college. For the next 11 years he was editor of *Mines and Minerals*. Since 1909 he has been at Illinois.

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JOHN ALEXANDER MATHEWS, president of the Crucible Steel Co. of America, was born in Washington, Pa., May 20, 1872. He was graduated from Washington and Jefferson college in 1896 and two years later from Columbia. He attended the Royal School of Mines at London, taking up research work. In 1902 became metallurgist in charge of experimental work at the Sanderson plant of the Crucible company. Two years later he was made assistant manager. In 1908 he became operating manager of the Halcomb Steel Co., later general manager and in 1915 president. At that time he also became president of the Syracuse Crucible Steel Co. He next became a director and vice president of the Crucible Steel Co. of America and president in 1920.

Technical Papers Reflect Research Work

JOHN V. FREEMAN, chief chemist of the central laboratory, Joliet, Ill., of the Illinois Steel Co., was born in St. Ignace, Mich., 1885. He was graduated from the Chicago School of Assaying and later specialized in industrial organic chemistry at the University of Chicago. He was chief chemist of the Lake Superior Iron & Chemical Co., now the Charcoal Iron Co. of America, at its Ashland, Wis., plant for three years. In 1908 he became chemist of the coal and coke committee of the United States Steel Corp., which position he has since held.

* * *

C L. KINNEY Jr., since 1911 superintendent of open hearth No. 1 at the South works of the Illinois Steel Co., was born in Wareham, Mass., Aug. 4, 1876. He was graduated from the Massachusetts Institute of Technology in 1899. He then became chemist for the Tremont Nail Co., later going with the Shickle, Harrison & Howard Co. and finally the South works of the Illinois Steel Co.

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R C. HELM, for the past four years in charge of the Worcester, Mass., district physical laboratory of the American Steel & Wire Co., was graduated from the Pennsylvania State college in 1913. He took a position in the chemical laboratory of the Pennsylvania Steel Co. at Steelton, Pa., for a short time and then became a laboratory assistant in the physical laboratory of the American Steel & Wire Co., engaging in the study of problems relating to both steel and copper wire. Later he was made first assistant and in 1918 was given charge of the laboratory.

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HARRY FOSTER BAIN, director of the United States bureau of mines, was born in Seymour, Ind., Nov. 2, 1872. He was graduated from Moores Hill college in 1890. He became affiliated with the geological survey of Iowa three years later and from 1895 to 1900 was assistant state geologist. Then for three years he engaged in private work in Colorado and became a geologist with the United States geological survey. In 1906 he became director of the Illinois geological survey and three years later became editor of the *Scientific and Mining Press*. After six years in that capacity he went to London with the *Mining Magazine*. From 1916 to 1918 he was on an exploration trip in the Far East, returning to become assistant to the director of the bureau of mines. In 1920 he was made director.

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G. H. JONES

W. P. CHANDLER JR.

JOHN A. MATHEWS

W P. CHANDLER JR., fuel and experimental engineer with the Carnegie Steel Co., was born in Wilmington, Del., in 1889. He is a graduate of Cornell university as a mechanical engineer. He started in the employ of the Carnegie company at Clairton, Pa., and after various duties in the rolling mills and inspection department, he entered the steam engineering department and was steam engineer from 1914 to 1917. Then he spent a year in charge of the boiler house of the Cleveland Furnace Co., Cleveland, and left to become assistant fuel and experimental engineer for the Carnegie company at Duquesne, Pa. In August this year he was promoted to fuel and experimental engineer at this works.

HARRY FOSTER BAIN

Choosing Steels for Automobiles

Mechanical Characteristics of Structural Materials Is of Prime Importance in Automotive Industry—Chemical Specifications Considered Only as They Define Physical Properties—Various Tests Conducted To Determine Merit Index

BY HENRY CHANDLER

PRIMARILY, the physical properties of automotive steels determine which of those steels are best adapted and most essential to the automotive industry. Speaking generally, the mechanical characteristics of materials determine, first, the product we are able to make, and second, the methods we are to employ in making it. The discovery of each new material invariably is followed quickly by the development of many new devices to adapt this new material to man's use. Conversely, the removal from the market of any of our common materials, such as copper or rubber, would result in a far-reaching industrial readjustment.

The more highly specialized an industry becomes in its development, the greater is that industry's dependence upon the properties of the metals peculiar to it. Our first thoughts in the development of a mechanical idea are governed by and limited to the materials then available. Later, competition and a fuller understanding of our actual needs result in the discovery of materials still more suitable. For instance, in the early pioneer days of the automobile industry, crankshafts were made from billets intended for rails, gears from tool steel, cylinders from iron suitable for stoves and, similarly, all other parts were made of the only materials then available.

Such practice would now be not only impractical but actually impossible. Today we rely upon specialized automotive steels for our major parts. The automotive manufacturer is now buying physical properties. The chemical specifications from which steels actually are purchased are not of importance in themselves but only for the physical characteristics which they decline. It is the mechanical characteristics of the steels that are of prime importance to the manufacturer, both in the design of his product and in the mechanical methods he is to employ in manufacturing it. These are the two factors that determine his commercial success.

The steels now used by the automotive industry, their treatment and characteristics, can be found amply described in the specifications of the Society of Automotive Engineers and other organizations. Detailed application of these specifications to a given part or group of parts is impractical without a thorough knowledge of the conditions demanded and can be of only individual interest. Therefore, we will attempt only to determine which of the many steels now used by the automobile builder are characteristically "automotive steels" and the general properties such steels must possess, in terms of the tests usually applied to them.

The adoption of a steel for commercial purposes is predicted upon two general questions; first, "How will this steel adapt itself to the necessary manufacturing processes?" and second, "Will the part when made of this steel withstand the forces, such as wear, breakage, etc., that operate for its destruction?" The answer to these questions is obtained through a survey of the mechanical characteristics of the metal. This two-fold importance of the physical properties suggests a natural division of the various parts of automobiles.

Steels Suited to Fabrication

Our first group will contain all those automotive parts which are made from steels in which the physical properties, that control the processes of fabrication, are of first importance.

This group includes most of our sheet metal parts, low stressed bolts, nuts and other screw machine products, as well as miscellaneous forgings, hardware and stampings. Such parts, due to design, when made from almost any material which will commercially meet the manufacturing requirements, are amply strong and tough to withstand all normal service conditions. Our specifications for this group are directed to simplify fabrication.

These requirements are easily and quickly ascertained. As a matter of fact, actual use becomes the best criterion and we are able to define our steels in terms of how they must behave in the shop. Our deep-drawing stock must draw deeply. Our screw machine stock must machine readily. Our forging bars must be free from defects and respond readily to forge and machine shop operations. Uniformity of quality is as important as degree of quality. In general, requirements of this nature are not peculiar to the automotive industry. They are common to all industries where steel is similarly fabricated and such steels are "automotive steels" for the single reason that large quantities of them are consumed by the automotive industry.

In particular cases, however, the manufacture of certain individual parts of this group has been developed into separate specialized industries and we here find a corresponding development of individual steels of this class into special steels. This has been the case particularly with frames, fenders, cold-headed bolts, disk wheels, bodies, etc. Each of these presents its individual problems and each requires its individual steel specifications, specialized proportionately to the refinements in manufacture and design which have been developed by the individual manufacturer.

Chemically expressed, the needs of this group are amply met by the standard grades of carbon steels now manufactured.

The second group contains those special automotive parts which are made from steels in which the physical properties demanded by service conditions are unusual and of first importance. Steels for such parts, due to the peculiar conditions of service to which they are subjected, must have individual physical properties developed to an unusual degree. The mere ease of manufacture is secondary importance and is considered only after the service requirements are amply met. Valves, ball bearings, magnets, armatures, hardened keys and the like are all typical of this class.

For example, in valves, strength, hardness and toughness must be maintained at high temperatures and the metal must withstand the corrosive and erosive effects of the products of combustion. To meet these particular requirements, many special steels have been developed, such as high tungsten, silicon-chromium, cobalt-chromium and others, each with its own peculiar advantages for this service, and each with its own distinct engineering following. It was only after long, intensive development of materials that ball bearings became possible for motor car use. Also the electrical properties now attained in armature and magnet steels are evidence of the specialized nature of these parts. Naturally then, this group requires special analyses. The manufacture of

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these parts or of the steels suitable for them can be undertaken commercially only after a thorough understanding of the complex problems involved.

The third group, and that one with which we are chiefly concerned, contains most of our major steel parts. The front axle and its various component units; our power train from piston pin, through connecting rods, crankshaft, transmission, universal joint, to the rear axles; springs; heavy duty gears; and, in general, all parts subjected to live loads of a high order are included in this division. These parts are uniquely automotive parts, that is, the forces of wear, fatigue and breakage to which they are subjected; the processes by which they are fabricated; and the economic factors which limit their cost, are peculiar to and characteristic of the automotive industry alone.

Aid Motor Development

The steels for these particular parts, therefore, truly may be called "automotive steels." Their development into the many standard grades of alloy steels has been coincident with and in a large measure responsible for the development of the motor car. Parts in this group, in operation, are subjected to much punishment. Wear, shock, vibration, torsion and other complex application of forces all tend to destroy their usefulness. Our steels must resist all these and at the same time readily and economically adapt themselves to the numerous processes of forging, heat treatment and machining, incidental to the production of these parts. The quality of our part cannot be separated from the cost of our part.

How then are the mechanical characteristics necessary to fulfill these conditions determined? The automotive manufacturer relies upon two types of test: first, that of actual use itself; and second, comparatively simple and rapid laboratory tests, whose indications he has learned to correlate with results of actual use.

The test of actual use, while undoubtedly our final criterion, nevertheless has serious disadvantages. It is generally slow and its results are difficult to express in terms usable in steel specifications. We cannot, for instance, describe our steel to the producer by stating that it must be the best and cheapest for our crankshafts, gears or other parts. We must have a means of measuring these requirements; some common method of defining the degree of hardness, strength, or other desired property. Therefore, laboratory tests, whose results may be numerically expressed, have been devised to furnish us with information as to the likely behavior of the metal in service. Such tests, in general, consist in measuring comparatively definite physical quantities by simple experiments which may be rapidly carried out and whose results may be checked easily.

It is not yet easy to say which and how many of the various physical properties, which metals possess, are of direct importance in the construction of these automotive parts. The conditions under which a motor car must operate are unusual. Long, hard, uphill or sandy pulls, shocks from rough and choppy roads, brakes suddenly applied, continued high speed, all these subject the mechanism to stresses and strains, and combinations of destructive forces, the results of which are difficult if not impossible to calculate. It is not a question of resistance to simple static stresses, but of the ability of the parts to withstand dynamic forces or the work done by these forces. The phenomena embraced in the terms fatigue, vibration and shock become important.

Dynamic tests, designed to isolate and measure the physical properties which determine the behavior of steel under these conditions, have been suggested. However, the great complexity of the various factors which determine the results of such tests and the little understood influences of slight changes in test conditions have limited their use, with but few exceptions, to qualitative rather than quantitative results.

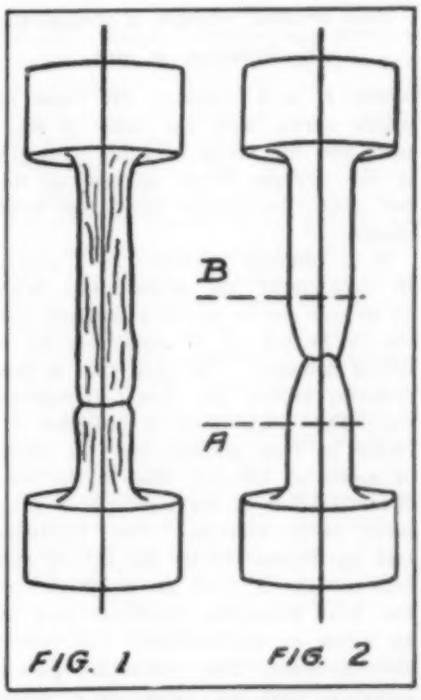

FIG. 1—TENSILE TEST BAR SHOWING LOW REDUCTION OF AREA. FIG. 2—SIMILAR BAR HAVING A HIGH REDUCTION IN AREA

Of the many properties easily measured, the automotive manufacturer depends chiefly upon those obtained by the following tests: 1. The tensile test; 2. the Brinell and scleroscope hardness tests; 3, an impact test (in this country generally the Izod); and 4. thermal and metallographic investigation. These tests, while not conclusive, nevertheless, when properly interpreted and supplemented by close observation of actual service, sufficiently define our steels for commercial purposes. Therefore, we will confine our discussion to the characteristics of these steels as disclosed by the above simple tests.

Rely On Tensile Test

Chief reliance is placed in the tensile test. It will be admitted readily that the use of some sort of a dynamic test, which would more closely approximate the conditions of automotive service, would be more justified. Nevertheless, the permanence of the tension test and the general acceptance of its data by both steel producers and steel consumers, lead us to anticipate that its results, when supplemented with other information, will within limits tell us much of the dynamic character of the steel.

Briefly, the tension test is this: A bar of steel, of known dimensions, is subjected to a tensile load. This load is increased gradually until rupture of the steel occurs. The maximum force so withstood by the bar is recorded as the ultimate tensile strength. The smallest load necessary to produce permanent set in the bar is designated as the elastic limit. Both of these are calculated on the basis of 1 square inch cross section. The percentage of increase in length and the change in cross section, due to the flow of the metal at the point of fracture, are also measured and calculated. The former of these is called the percentage of elongation and the latter, the percentage reduction in area.

Obviously, such a test does not duplicate the conditions to which the steel is subjected in actual motoring service. Its real value lies in our ability to correlate the data so furnished with the results of our other tests and the results of actual engineering experience. Tensile strength, elastic limit, reduction in area and elongation, these simple properties, when taken individually, convey little; but

collectively, and with proper emphasis on their relation to each other, they form a sound basis for estimation of quality.

Automobile parts are with few exceptions of great enough size and mass to withstand many times the static load which they are called upon to bear. As a matter of actual practice, it is the ability to take punishment, such as shock, vibration, impact and the wear and tear of the roads, that we require of our materials; and it is the ability of a unit mass of steel to withstand work done upon it that we try to determine. Remembering, then, that the physical properties, made evident by the tensile test, are properties of a test bar and are only indirectly properties of the steel tested, let us examine the results of this test in terms of the work actually done and the metal actually affected.

During the breaking of the bar, we are doing work; that is, we have a measured variable force starting at the elastic limit, gradually increasing up to the ultimate strength and then decreasing to the breaking load, which moves in all a distance equal to the total elongation of the bar. Since both the force applied and the distance through which it moved are known, the work done is easily calculated.

The actual amount of the material in the bar, the usefulness of which is practically destroyed by this work, is more difficult to determine. Our reduction in area, however, gives us an indication of this quantity. When we examine the test bar after the test, it will be found that the metal directly back of the fracture still is able to withstand a slight amount of work; still farther back, more work; and so on until metal but slightly affected is reached. The reduction of area describes and is a rough measure of the degree of this condition. It is of more importance qualitatively than quantitatively.

Examples of Area Reduction

Consider for a moment the accompanying illustrations. Fig. 1 represents a fractured tensile test bar of a material of low reduction in area, as characterized in certain bronzes. Fig. 2 represents a similar bar of a material such as an alloy steel, showing high reduction in area. Let us assume that the mean breaking strength and percentage of elongation were in each case identical. Thus, with no further evidence, it would be assumed that the materials were equally strong and tough and equally suitable for our automobile part.

It will be observed, however, that there is a marked difference in the appearance of the two test pieces. The steel bar shows a marked necking down at the point of fracture, due to the local flow of metal between the lines *A* and *B*, while the bronze bar has stretched almost uniformly throughout its entire length. Hence, although the same amount of work was performed in rupturing both test pieces, it can be seen readily that the mass of metal affected in the bronze was considerably greater than that in the steel. Consequently, the resistance of a unit mass of the material of the bar in Fig. 2 was greater and the reduction in area is a measure of this fact. The higher the reduction in area, other conditions being equal, the greater the ability of a unit mass of the steel to withstand work done upon it.

The tensile test therefore may be considered as a dynamic test where work is done at a slow rate. Its results, as a measure of work done and metal affected, while not numerically exact, are at least proportional to them. This relationship might, roughly, be expressed as follows: Quality of metal as evidenced by the tensile test is equal to

$$\frac{\text{Work done}}{\text{Metal affected}}$$

which is proportional to

$$\frac{\text{Mean breaking strength} \times \text{elongation}}{K\text{—Reduction in area}}$$

where K is a constant, the value of which varies with the type of fracture, and the mean breaking strength is the average force applied to the bar after the elastic limit has been passed.

It is common practice, as a check, to supplement the tensile test with an impact test in which a notched test bar is broken at a rapid rate by a falling hammer. The Izod test, in this country, enjoys the most widespread use. The work done is recorded directly in foot pounds and the mass of metal so affected, due to the mechanical effect of the notch, is in each piece fairly constant. Our hardness test, as determined by the Brinell and scleroscope, is used as a check on our heat treatment processes and as an index to machinability and resistance to wear. The results are purely empirical and of value only when coupled with the observations of experience.

Difficulties will arise immediately if we endeavor to apply too literally the results of any of these tests to conditions greatly different from our test conditions. Other considerations, based upon the metallographical makeup of the steel, may change these results greatly under the conditions of actual service. Steels, as a class, are composed of a mixture of crystalline and amorphous materials. The relative sizes, proportions, distribution and qualities of these constituents, play an all important part in the behavior of the steel, under various applications of forces. Metallographical and chemical investigation are doing much to determine this relationship between microstructure and physical properties. However, in uniform materials, uniformly heat treated, these conditions are fairly constant, and except in special cases to determine soundness, metallographical investigation is confined largely to pure research.

Effect of Heat Treatment

Steels for the parts now under discussion invariably are used in the heat treated state. The behavior of the steel under thermal treatment also bears a relation to its dynamic characteristics. When a piece of steel is heated beyond its critical point, it undergoes a chemical and physical transformation. If thereafter it be slowly cooled, this transformation reverses itself and the material returns to its normal state. However, when the steel is quenched, the physical and chemical changes which took place during the heating have now no opportunity to reverse and the material, when cool, is consequently in a state of unstable equilibrium. This degree of instability is measured by the temperature to which we can subsequently reheat or draw the steel after quenching and still maintain our requisite strength. In other words, the higher the drawing temperature that the steel can withstand, the greater is its molecular stability and the greater is its resistance to any subsequent molecular change, whether the latter be produced mechanically or otherwise.

Other factors being equal, the steel with the highest drawing temperature will be the most satisfactory for those automotive parts that require resistance to fatigue. But here again caution must be exercised lest our conclusions carry us beyond a logical point, because the metallographical size, nature and distribution of the constituents of the steel are also factors to be reckoned with. We have

(*Concluded on Page* 1205)

Heating Furnace Conserves Fuel

Tests Conducted on Metallurgical Units for Heating Blooms, Slabs and Billets Show Continuous Recuperative Type Most Economical—Suggests Design for Efficient Furnace and Recuperator—Any Fuel May Be Used

BY W. P. CHANDLER, JR.

VARIOUS methods of firing metallurgical heating furnaces will be discussed in this paper. Two certain types of furnaces with which the author is particularly acquainted, being described. These furnaces use by-product coke oven gas as fuel, but conclusions can be drawn from the results of tests, that may be applicable to future development of furnaces using any type of fuel in order to obtain more efficient and better heating.

Choice of fuels for use in heating furnaces is governed by availability and cost. When natural gas was plentiful and cheap practically no other fuel was used, but with the growing scarcity of this fuel, operators have been forced by considerations of cost and even by law to substitute other fuels. The gaseous fuels such as natural or by-product gas are ideal fuels for use in heating furnaces. They require the least amount of equipment; a gas main, regulator and burners with necessary valves make a complete installation. The varying demand of the furnace can be met readily with an increase or decrease in the supply of fuel, while the temperature of the furnace can be held at any point within the range required for heating steel. The most important factor governing the successful use of a gaseous fuel is the maintenance of a constant pressure on the burner valves. This can be accomplished by the installation of an automatic pressure regulator.

Require More Equipment

Liquid fuels such as by-product tar and fuel oil require additional equipment. A storage tank equipped with some means of heating the fuel, such as pipe coils filled with steam, a pump, pressure regulator and atomizing burners with the necessary piping and valves make up the usual installation. The atomizing burners may be of the pressure type or may require steam or compressed air, in which case a source of supply for the atomizing agent must be provided. As in the case of gaseous fuels, constant pressure for both fuel and atomizing agent are requisite for good operation of the furnace. The main reasons these fuels have not found broader use lies in the scarcity of by-product tar and the cost of fuel oil at the main steel mill centers.

Solid fuel in the form of coal has been used in many reverberatory heating furnaces. Originally, the firing was done by hand and the ashes removed by manual labor. The high labor cost in this country has forced the development of labor saving devices. The mechanical stoker has found ready application and a large number of furnaces are operated in this manner at present. The installation, aside from the stoker proper, requires the addition of coal and ash handling machinery, bins and, in the case of forced draft stokers, the necessary fans and air ducts. It also precludes to a great extent the savings that can be obtained from recuperation of the air for combustion.

Another development in the application of coal as fuel for heating furnaces has been through the use of gas producers. By this method the preparation of the fuel is removed from the furnace and the heater has to deal with only a gaseous fuel. Only about 80 per cent of the heating value of the coal is realized in the producer gas, however, and with the rapidly rising cost of coal in this country it will become more and more difficult to justify this loss. There is a large increase in the initial cost of the furnace installation to provide the producers, building, coal and ash handling machinery, gas flues and steam lines. A general estimate of the cost hardly can be made, since much depends on the individual installation. The size of the producer plant, location with reference to furnaces served, number of furnaces to be operated from one producer plant and such items require that a separate study be made for each case. The cost of operating the producer plant, that is gasifying the coal, must be added to the fuel cost in any comparison of prices of various fuels.

In recent years powdered coal fired heating furnaces have found favor in many plants, particularly in France. A number of problems in its use will have to be overcome successfully before its adoption will become general. Removal of the ash from the products of combustion or provision for its free passage through the furnace must be provided in order to insure uniform heating of the steel. The intense flame with its consequent cutting action on the steel must be cared for, and the gain in efficiency due to preheating the air for combustion will increase this difficulty by causing a still more intense flame. A number of methods and systems for pulverizing, conveying and firing powdered coal are on the market, and if the various difficulties can be overcome successfully, material savings in fuel may be obtained.

Electrical Heating Successful

Application of electrical heating in metallurgical work is comparatively new. Furnaces using electrical heat for heat treatment of steel, either as castings or forgings, are successful and on account of the accuracy with which the desired temperature may be maintained and the freedom from oxidation, it is found that it pays to use the more expensive fuel or source of heat, electricity. It is doubtful if electricity will be used to heat steel in the form of blooms, slabs and billets made of ordinary steel, except in special localities where electricity is cheap and fuel is scarce and expensive. However, where steel is placed in a furnace hot and merely receives a soaking heat, as in the case of ingots in soaking pits, the amount of electric current required per ton of steel is small and it is probable that the saving due to freedom from oxidation or scale and from burnt steel will more than compensate for the cost of the electric current. Such electrically heated soaking pits have been designed, although they are not in operation at the present time.

Table II has been prepared to show the allowable price that can be paid for various fuels to be equivalent in heating value to natural gas at $0.30 per thousand cubic feet. The cost of preparing and firing the fuels has been added in arriving at the allowable price, but no allowance has been made for the efficiency obtained in the furnace itself. Also no charge for depreciation or interest on the initial

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From a paper presented at the New York meeting of the American Iron and Steel institute, Oct. 27. The author is fuel and experimental engineer, Carnegie Steel Co., Duquesne, Pa.

investment has been made, since so much depends on the individual installation.

Two main types of furnaces are used for heating blooms, slabs and billets, the continuous and the noncontinuous. The latter is similar in construction to the siemens open-hearth furnace; the direction of the gas flame across the hearth is reversed periodically and the furnace usually is equipped with regenerative checker chambers for preheating the air used for combustion. The blooms or slabs which this type of furnace usually heat are charged on the hearth of the furnace and remain in the one place until hot enough to roll. The continuous furnace is not reversed, the flame always traveling in the one direction, while the steel usually in the form of billets passes through the furnace in the opposite direction. The cold billets enter the furnace at the coolest point and are pushed forward to the point of maximum temperature where they are discharged to the rolls. In the continuous furnace the billets lie tight together on the skids, forming a large steel plate on the floor of the furnace. In the noncontinuous furnace there is an open space between the blooms, so that three sides are available for directly absorbing the heat from the products of combustion or roof, while the fourth side is resting on the heated hearth of the furnace and absorbs from it a large amount of heat.

The time required for heating billets, slabs or blooms depends on the nace. Only the top of the billet is exposed so that all the heat required to bring the steel to rolling temperature must be absorbed by this sur-

Table I

Determination of Furnace Efficiency and Heat Balance

	No. 2	No. 2	No. 2	No. 5	No. 5	No. 5	No. 6	No. 6	No. 6
Furnace number	1	2	3	1	2	3	1	2	3
Test number	6-11-20	6-12-20	6-13-20	6-3-20	6-4-20	6-5-20	6-29-20	7-1-20	7-13-20
Date	410	460	420	370	200	260	410	410	430
Duration in minutes	Continuous Brick Recuperator			Non-Continuous Regenerative			Continuous Cast Iron Recuperator		
Type of furnace	10	32	32	18	18	18	32	32	32
Width of furnace inside, in feet	29	29	29	36	36	36	25	25	25
Length of steel travel inside furnace, in feet	2	2	2	...	...	...	2½	3½	3½
Length of hearth of furnace, in feet									
STEEL:									
Carbon content of steel heated	8/35	8/35	15/25	10/30,	27/37	40/50; 12/18	113	8/12; 15/20	13/24; 05/115;
							22		22/35; 8/12
Section of billet in inches	3½ x 3½	3½ x 3½	2½ x 2½	5½ x 5½	5½ x 5½	5½ x 5½	3 x 2	2½ x 2½	2½ x 2½
		2½ x 2½							
Weight of billet, pounds	1,100	1,100-430	550	300-1,480	1,120	1,300-1,700	430	650	650
Total billets heated, number	345	361	532	178	142	177	917	693	962
Total weight heated, pounds	379,500	304,400	292,600	225,000	159,040	284,520	393,140	450,450	630,300
Weight of steel heated per hour, pounds	54,214	45,637	60,400	36,486	32,005	40,743	55,020	65,052	60,014
Temperature of steel entering furnace, degrees F	85	91	82	85	89	90	86	81	77
Temperature of steel leaving furnace, degrees F	2,087	2,179	2,104	2,076	2,047	2,115	2,050	2,052	1,994
COOLING WATER:									
Gallons per hour	6,000	6,000	6,000	...	...	...	4,695	4,695	4,695
Inlet temperature, degrees F	76	75	75	...	...	...	75	76	74
Outlet temperature, degrees F	81	82	82	...	...	...	97	92	94
FUEL GAS (By Product):									
Analysis by volume—									
CO_2, per cent	1 6	1 6	1 6	1 4	1 4	1 4	1 6	1 6	1 6
C_2H_6, per cent	2 8	2 8	2 8	1 8	1 8	1 8	2 6	2 6	2 6
CO, per cent	5 2	5 2	5 2	5 6	5 6	5 6	5 6	5 6	5 6
CH_4, per cent	33 6	33 6	33 6	34 4	34 4	34 4	34 4	34 4	34 4
H_2, per cent	53 2	53 2	53 2	53 6	53 6	53 6	53 2	53 2	53 2
N_2, per cent	3 6	3 6	3 6	3 2	3 2	3 2	2 4	2 4	2 4
Heating value per cubic foot, B. T. U.	510	510	510	505	505	505	515 30	515 30	515 30
Pressure of gas at meter, inches Hg.	2 66	3 79	3 75	3 18	3 44	3 72	3 52	3 16	3 57
Temperature of gas at meter, degrees F	82	82	82	84	85	88	63	63	82
Quantity of gas by meter, cubic feet	433,940	321,007	436,400	286,400	199,500	441,700	316,200	315,300	317,000
Calibration factor of meter	1 12	1 08	1 12	813	83	915	08	08	08
Total gas burned std. conds., cubic feet	397,705	330,558	401,070	360,708	250,039	484,101	316,006	409,545	305,257
Gas burned per ton steel, cubic feet	2,347	2,425	2,598	3,790	3,522	4,095	3,900	2,485	2,527
Gas burned per minute std. conds., cubic feet	940 9	823 9	955	1,029	962	1,341	1,259	1,318	1,177
AIR:									
Barometric pressure, inches Hg	29 15	29 21	29 22	29 42	29 33	29 44	29 36	29 14	29 02
Temperature near furnace, degrees F	85	91	97	85	89	90	90	91	77
Temperature after roof recuperator, degrees F	...	...	...	...	...	...	176	171	173
Pressure at fan discharge, inches water	2 11	2 66	1 55	...	...	...	2 35	2 38	2 48
Pressure at entrance to recuperator, inches water	2 11	2 40	1 55	...	...	...	2 35	2 38	2 48
Pressure at burner, inches water	...	...	...	...	...	...	1 17	1 00	1 07
Loss in air pressure through recuperator, inches water	2 11	2 40	1 55	...	...	...	1 18	1 38	1 41
Temperature at burner, degrees F	333	434	448	1,852	1,862	2,035	413	407	394
North end, inside regenerator, degrees F	...	...	...	1,878	1,911	2,112	...	...	...
North end, outside regenerator, degrees F	...	...	...	1,845	1,866	1,988	...	...	...
South end, inside regenerator, degrees F	...	...	...	1,877	1,877	2,037	...	...	...
South end, outside regenerator, degrees F	...	...	...	1,833	1,830	1,967	...	...	...
Cubic feet excess air in recuperator or regenerator gas, per cubic foot fuel gas	1 71	2 06	1 40	3 20	3 25	3 44	3 06	3 06	3 06
Cubic feet excess air in stack gas, per cubic foot fuel gas	3 90	5 00	4 73	3 26	3 26	3 44	7 00	6 26	6 20
Cubic feet air for theoretical combustion, per cubic foot fuel gas	5 01	5 01	5 01	4 99	4 99	4 99	5 10	5 10	5 10
Cubic feet air through recuperator or regenerator, per cubic foot fuel gas	6 55	5 10	5 14	5 22	4 93	5 12	7 46	6 92	6 55
Cubic feet air infiltrated through recuperator or regenerator, per cubic foot fuel gas	4 26	3 93	3 53	...	...	...	3 01	4 42	4 54
Cubic feet air used for combustion, per cubic foot fuel gas	6 72	7 07	6 43	9 25	8 24	6 43	9 06	9 06	9 06
Cubic feet air used for combustion not heated in recuperator, per cubic foot fuel gas	2 17	1 97	2 07	3 67	3 31	3 31	1 60	.13	3 51
FURNACE CONDITIONS:									
Flame temperature, degrees F	2,600	2,622	2,570	2,363	2,511	2,676	2,430	2,400	2,408
Analysis of gas entering recuperator—									
CO_2, per cent	7 4	7 0	7 5	5 33	5 80	5 5	...	...	6 3
O_2, per cent	5 9	6 7	5 1	8 36	8 75	8 46	...	...	11 3
CO, per cent	0 1	0 1	0 1	...	...	...	...	...	1
N_2, per cent	86 6	86 2	87 0	86 00	85 45	86 22	...	...	82 3
Cubic feet such gas, per cubic foot fuel gas	6 93	6 46	7 82	8 14	7 75	8 49	...	...	7 34
Temperature of gas entering regenerator or recuperator, degrees F	1,006	1,125	1,004	1,956	1,974	2,071	1,316	1,301	1,231
Per cent of total heat returned through recuperator or regenerator	4 86	6 39	4 26	33 23	31 34	35 12	6 18	7 41	4 32
Average temperature gas leaving regenerator, degrees F									
North end, inside regenerator, degrees F	...	...	...	826	820	1,016	...	...	...
North end, outside regenerator, degrees F	...	...	...	975	969	954	...	...	...
South end, inside regenerator, degrees F	...	...	...	739	1,007	966	...	...	...
South end, outside regenerator, degrees F	...	...	...	874	969	976	...	...	...
Stack analysis—									
CO_2, per cent	4 4	4 4	4 7	5 33	5 80	5 5	4 0	3 7	3 7
O_2, per cent	12 0	12 0	10 1	8 36	8 75	8 46	13 3	13 8	14 0
CO, per cent	...	...	...	...	...	...	...	...	...
N_2, per cent	83 6	83 6	85 2	86 00	85 45	86 22	82 8	82 5	82 3
Cubic feet, per cubic foot fuel gas	10 45	10 45	9 79	8 14	7 76	8 49	11 75	12 7	12 7
Temperature of stack, degrees F	548	560	554	830	806	696	758	620	488
EFFICIENCIES (Per Cent):									
Furnace	62 15	62 07	58 20	39 70	40 91	36 47	47 30	57 40	52 52
Recuperative, based on available heat in recuperator or regenerator gas	22 09	26 06	20 25	39 73	38 67	37 80	19 00	23 02	14 20
HEAT BALANCE	B.T.U. %	B.T.U. %	B.T.U. %	B.T.U. %	B.T.U. %	B.T.U. %	B.T.U. %	B.T.U. %	B.T.U. %
Heat delivered, per hour	28,676 100	25,199 100	29,221 100	31,160 100	26,143 100	27,611 100	27,986 100	27,693 100	26,262 100
Heat absorbed by steel, per hour	18,017 62 15	15,894 63 07	17,082 58 20	12,050 38 70	10,686 40 91	13,716 36 47	17,974 47 3	21,844 57 41	19,068 53 52
Loss of heat in cooling water	332 1 14	283 1 53	283 1 33	...	...	...	324 2 17	399 1 99	749 2 96
Loss to moisture burning H_2	763 2 64	687 2 73	790 2 70	1,342 4 31	1,163 4 45	1,817 4 82	1,348 3 55	1,167 5 10	1,189 3 37
Loss to dry stack gases	5,087 17 55	4,169 16 55	4,923 16 85	6,876 22 39	5,773 22 08	9,845 26 18	9,971 26 34	9,217 39 72	9,484 36 09
Loss to radiation	4,775 16 48	3,863 14 84	6,260 20 84	10,793 34 60	8,512 32 56	12,233 32 32	7,866 20 74	4,966 13 18	5,840 .22 .25

temperature of the heating medium, the surface of the steel exposed and the thickness of the steel. The temperature of the continuous furnace is at a maximum only at the discharge end and gradually decreases to the rear, while only one side of the billet is available for absorbing heat. In the noncontinuous furnace the temperature is at the maximum throughout and three sides of the billet are available for absorbing heat. It is evident, therefore, that the same sized billet must remain longer in the continuous than in the noncontinuous furnace. The dimensions of the noncontinuous furnace do not affect directly the time of heating, but in the continuous furnace, with the rolling mill handling a given number of bars per hour, the length of the furnace fixes the time of heating. With everything else the same, the time of heating in a continuous furnace varies as the square of the thickness of the billet, so that a 5-inch square billet requires four times as long as a 2½-inch square billet. This means that for the larger sizes of billets long furnaces are required to give the capacity required by the rolling mill. For blooms and slabs the general practice so far has been to use noncontinuous furnaces, but for 5 x 5-inch billets and smaller the continuous furnace proves satisfactory.

Certain of the alloy and spring steels, if heated too rapidly, tend to crack, so that care must be used in bringing such billets up to rolling temperature. The continuous furnace fits this class of steel admirably since the billet enters a relatively cool part of the furnace and is heated gradually to the temperature required for rolling.

A sketch of a noncontinuous regenerative furnace is shown in Fig. 1. The hearth which is 18 feet wide and 35 feet long has a silica bottom, made by fusing sand in thin layers until the proper thickness is reached. A slight slope toward the rear of the furnace allows the slag which forms to drain through spouts into slag pots. The steel is charged and drawn through doors in the front by a charging machine. Four ports are provided at each end of the furnace, through which the gas with part of the air for combustion is admitted. The remaining air for combustion enters through a wide port opening between the roof and the top of the gas ports. Two regenerative checker chambers are provided at each end of the furnace, as producer gas was the fuel initially used and this gas was preheated as well as the air for combustion. The checker chambers are connected to the stack by flues containing valves and dampers, so arranged that the direction of the flow of the hot products of combustion across the hearth may be reversed periodically. In this manner the gas is first burned through one end of the furnace, while the waste gases leave at the opposite end, heating the checkers in their passage to the stack. The flow is then reversed, the gas is burned through the other end and the air for combustion is preheated in the checker chambers which have just received their heat from the waste gases.

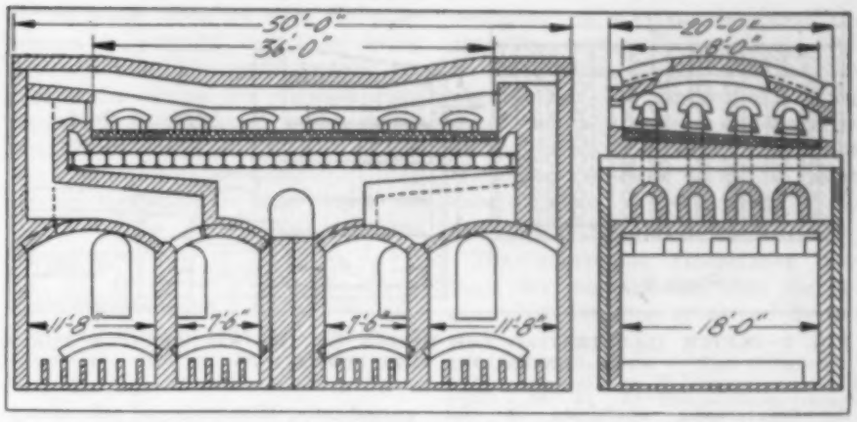

FIG. 1—SKETCH OF A NONCONTINUOUS REGENERATIVE FURNACE HAVING A HEARTH 35 FEET LONG AND 18 FEET WIDE

Two of these furnaces serve one rolling mill. With one furnace containing steel heated and ready to roll, the first door is opened and the part of the hearth served by this door cleared of steel. Then the second door is started in the same manner, and while drawing the second door, the first is recharged. This is continued till all the hot steel has been drawn and the furnace refilled with cold blooms. The charging machine then moves to the second furnace and repeats the operation. By alternating the furnaces little time is lost waiting on hot steel. Blooms varying from 5 x 5 inches to 9½ x 11 inches are heated in this furnace.

Efficiency tests conducted on the furnace just described were made in the following manner: The amount of by-product gas used as fuel was measured by a proportional meter, which was calibrated with a pitot tube for various rates of flow. The pressure of the gas was measured with a mercury U gage, the temperature with a mercurial thermometer, and samples were taken for chemical analysis from which the heating value was calculated. A record was kept of the number and size of blooms heated and the temperature of the steel leaving the furnace was measured by an optical pyrometer. The steel entering the furnace was at atmospheric temperature. Analysis of the waste gases in the flues leading from the checker chambers to the stack were made with a standard apparatus.

Four thermocouples were installed, two at either end of the furnace, with one in each of the flues leading from

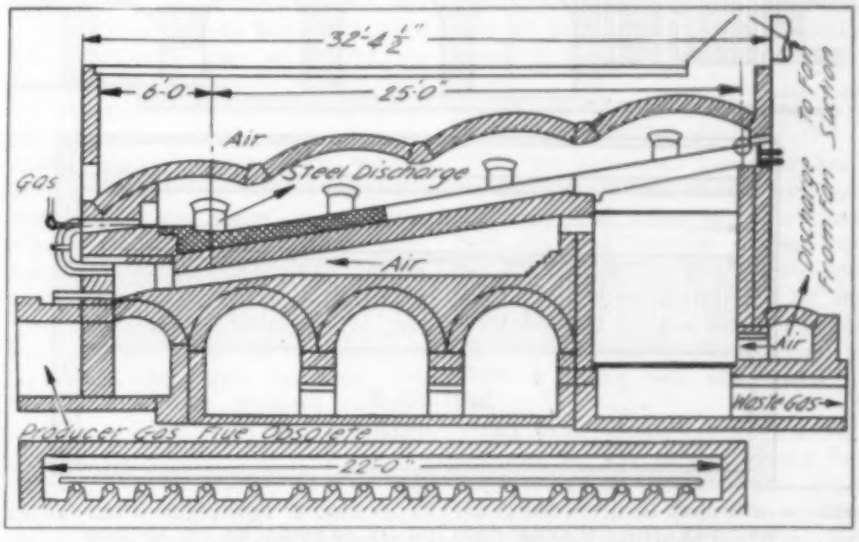

FIG. 2—CONTINUOUS TYPE RECUPERATOR FURNACE FOR HEATING BILLETS

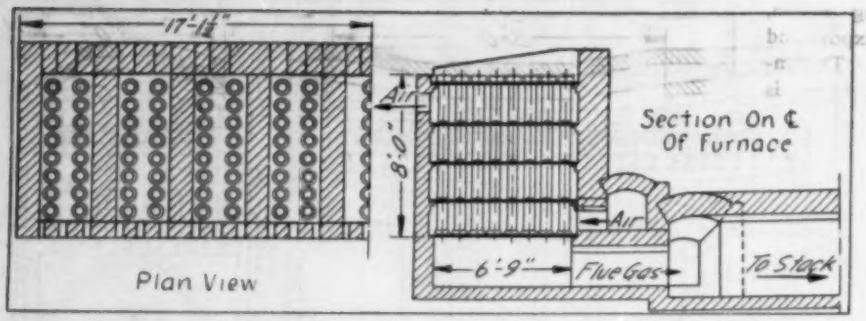

FIG. 3—SKETCH ILLUSTRATING THE DESIGN OF THE RECUPERATOR FOR A CONTINUOUS TYPE FURNACE

the regenerative chambers to the stack. In this manner the temperature of the waste gases leaving each regenerative chamber was determined and the average of all readings used for calculating the stack loss. The temperature of the preheated air entering and of the waste gases leaving the furnace was obtained with an optical pyrometer sighted on the brick walls of the flues leading from the regenerative chambers to the ports, determinations being made on the air from each chamber. Readings were also taken of the furnace temperature with an optical pyrometer, and atmospheric temperature near the furnace with a mercurial thermometer. The barometric pressure was read during each test and the specific gravity of the gas checked periodically. Readings of all instruments were taken every 10 minutes during the test and samples of waste gas were analyzed every 10 minutes.

The regular operation of the furnace consisted of a drawing and charging period followed by a heating period, which required that the starting and stopping point of the test be at the same point in the cycle in order that the gas supplied and the steel heated would bear the correct relation to each other.

The following methods were employed in calculating the results shown in the following pages: The heat absorbed by the steel was found from the weight of steel heated, the temperatures of the steel entering and leaving the furnace and the specific heat of steel which for these tests was taken as 0.166. The weight of steel was obtained from the number and weight of blooms entering the furnace. The heat supplied to the furnace was determined from the heat value of the fuel gas, as calculated from the chemical analysis and the number of cubic feet of gas burned reduced to standard condition of 62 degrees Fahr. and 30 inches of mercury pressure.

The losses were calculated according to the usual engineering practice, the loss to radiation being taken as the difference between the heat supplied in the gas and the sum of heat absorbed by the steel and all losses except radiation. The efficiency of the furnace as shown is the ratio of the heat absorbed by the steel to the heat delivered in the gas. The efficiency of the regenerator was calculated by assuming that all the heat in the gases entering the regenerator was available for absorption by the air. The difference between the heat content of the gases entering and leaving the regenerator was assumed as the heat absorbed by the air. The efficiency shown is the ratio of the heat absorbed by the air to the sensible heat of gases entering the regenerator.

From the analysis of the waste gases a study was made of the infiltration of air at various points. The amount of excess air in the waste gases leaving the regenerator was first calculated. The air entering the furnace through the ports was calculated by a heat balance of the regenerator assuming no radiation. This assumption is true partially because the regenerators are entirely under ground and are therefore thoroughly insulated. The difference between the amount of air entering the ports and the amount of air used for combustion with the excess as shown in the regenerator gases is the amount of air that infiltrated through the doors and openings in the furnace.

From the tabulated results it will be seen that the efficiencies varied from 36 to 41 per cent. It is interesting to note that with the highest efficiency the following conditions prevailed: The lowest rate of heating steel, the lowest gas consumption, the lowest radiation and the lowest stack loss, while the reverse conditions prevailed on the test having the lowest efficiency. It will be seen that the greater rate of heating is accompanied with greater furnace temperature and the corresponding greater heat losses.

A sketch of a continuous billet heating furnace equipped with a recuperator for preheating the air for combustion is shown in Fig. 2. The billets enter through a side door in

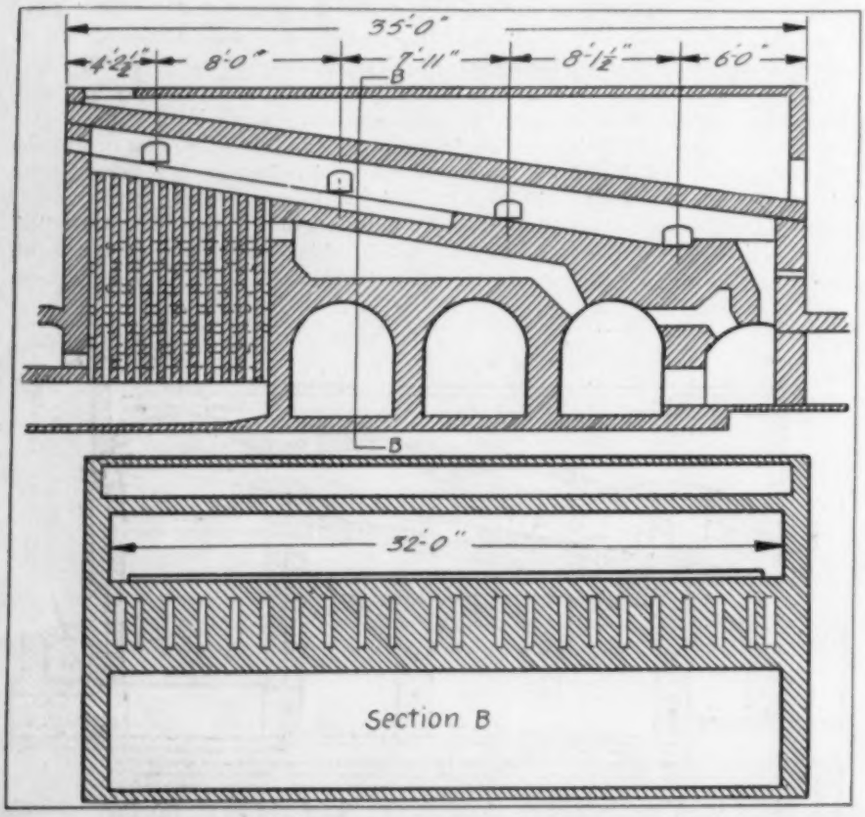

FIG. 4—ANOTHER CONTINUOUS BILLET FURNACE EQUIPPED WITH BRICK RECUPERATOR. WATER COOLING ON SKEWBACKS OF ARCHED ROOF HAS BEEN ELIMINATED

the upper end of the furnace, passing into the furnace on rollers, are pushed forward on the skids of the furnace by a set of arms which operate through the rear end wall and are discharged through a small door in the side wall at the other end of the furnace by a pusher bar driven by pinch rolls. The discharge door is in line with the first pass of the roughing rolls, so that the billet enters the rolls before being completely discharged from the furnace. This design is possible where only one furnace supplies a mill. If two or more furnaces are used the billets usually fall from the hearth through the end of the furnace, upon the rollers of the transfer table. This design necessitates having an opening in the end of the furnace extending the full width. The opening is partially closed by swinging doors, bars or pipes, but allows a large amount of cold air to pass into the combustion chamber at the point where the billets are being heated to their highest temperature.

The roof consists of four arches thrown in the direction of travel of the steel. The skewbacks for these arches are supported by a water-cooled system of pipes hung by straps from steel beams which rest on the side walls of the furnace. The side walls extend three feet above the arch. Steel trays filled with sand are placed over the beams forming an air space over the roof. Water-cooled skids are used to bridge the opening into the recuperator chamber, but no water cooling occurs beyond the point where the fire brick floor of the furnace commences.

Cast iron skids support the billets to within 3 feet of the discharge door where a magnesite brick bottom, built flush with the tops of the skids covers the floor of the hearth. The cast iron skids without water cooling give excellent service. Fifteen burners are provided across the end of the furnace. The burner consists of a cast iron return bend having a small gas pipe concentrically located in the upper leg, while the air for combustion is supplied through the lower leg which is provided with a butterfly regulating valve. Mixing of air and gas takes place beyond the nose of the gas pipe, the flame entering the combustion chamber through the ports of the furnace.

The recuperator for preheating the air used for combustion is shown in Fig. 3. It consists of vertical cast iron pipes supported by plates with additional baffling plates. The products of combustion pass downward through the pipes to a flue leading to the stack. The air used for combustion is partially heated by being drawn through the space between the roof of the furnace and the sand trays supported on the cross beams by a fan, which discharges through a flue into the recuperator chamber. The air passes upward on the outside of the cast iron pipes receiving heat through the walls of the pipes. Leaving the recuperator, the air passes under the floor of the furnace through ducts to the opposite end, where it enters the bottom leg of the cast iron burners. The furnace is used for heating from 1½ to 2½-inch square billets.

A second continuous billet heating furnace is shown in Fig. 4. This furnace has a flat roof which eliminates the water cooling used on the skew-backs for the arched roof. It is also equipped with a brick recuperator. The downward passageways are square brick flues, while the air for combustion is baffled, in the manner shown, to make seven passes across the heated brick walls.

The brick recuperator has received a great deal of attention abroad and a number of special form tiles have been developed with which the recuperator is constructed. In one type, the recuperator chamber is located below the furnace. The air for combustion passes upward, by natural draft, through vertical rectangular flues, while the waste gases entering at the top travel through horizontal flues and make two passes across the outside of the air-carrying tile. Great care has been used to prevent leakage from the air passageways into the waste gas flues and the tile has been designed as thin as is consistent with the necessary strength.

Tests were conducted on the two continuous recuperative furnaces just described in a manner similar to those conducted on the noncontinuous regenerative furnaces with only the necessary changes due to difference in construction. The amount of cooling water used was measured and the inlet and outlet temperatures noted. The calculations followed along the same lines as those described for the regenerative furnace.

The continuous recuperative furnaces are more efficient than the regenerative furnaces as shown below:

Furnace No.	Run No. 1	Run No. 2	Run No. 3	Type of furnace
2 Mill..	62	63	58	Continuous recuperative
5 Mill..	38	41	37	Noncontinuous regenerative.
6 Mill..	47	57	53	Continuous recuperative

This higher efficiency is due to the method of operation of the continuous furnace; namely, the cold steel enters the furnace at one end and progresses slowly toward the other end, at which time it has become hot enough to roll. The gases traveling in the opposite direction—from the hot to the cold end—are cooled by the steel and therefore leave the furnace chamber at a much lower temperature than the gases of the regenerative furnace. In the latter furnace all parts of the hearth are maintained at the same temperature.

	Degrees Fahr.
Noncontinuous regenerative	2001
Continuous recuperative	1192

The principal heat losses of heating furnaces are the stack losses and radiation. The following table taken from the heat balances secured during the tests shows the relative proportions of these losses and of the heat absorbed by the steel. For the amounts of heat in B.t.u. refer to Table I, giving data and results of test.

This table clearly shows the reason why the use of regenerative furnaces should be limited to only those places where it is impossible to apply the continuous recuperative fur-

Table II

Allowable Price for Various Fuels

Heating Value To Be Equivalent to Natural Gas at 30 Cents per Thousand Cubic Feet

Fuel	Natural Gas	By-Product Gas	By-Product Tar	Fuel Oil	Coal as Producer Gas
Unit	1000 cubic feet	1000 cubic feet	1 gallon	1 gallon	1 gross ton
B.t.u. per unit delivered at heating furnace	950,000	496,000	156,000	137,600	24,192,000.
Eqtivalent of 1000 cubic feet of natural gas	1,000	1,915	6.09	6.90	0.03926
Cost of preparing per unit	$0.00	$0.00	$0.00023	$0.00023	$1.60
Cost of firing per unit	0.00	0.00	0.005	0.004	.....
Total cost of equivalent of 1000 cubic feet of natural gas	0.30	0.30	0.30	0.30	0.30
Cost above fuel of equivalent of 1000 cubic feet of natural gas	0.00	0.00	0.0304	0.0276	0.0628
Allowable cost equivalent of 1000 cubic feet of natural gas	0.30	0.30	0.2696	0.2724	0.2372
Allowable cost per unit to be equivalent to total cost of 1000 cubic feet of natural gas	0.30	0.157	0.044	0.040	6.04

nace, for less than half of the heat in the gas enters the steel in the non-continuous regenerative type. The regenerative furnace does not lend itself to insulation to prevent radiation, because the temperature over the entire chamber is the same and usually so intense that if insulation were applied, the limit of the refractories would be reached and the furnace destroyed. The continuous recuperative furnace, on the other hand, does lend itself to insulation to prevent radiation, because this furnace is comparatively cool and most of the radiating areas can be insulated.

The two continuous furnaces tested had different recuperators as before mentioned. The following table gives the losses in air pressure through the two types:

Furnace No.	Type of recuperator	Drop in pressure inches of water Run No. 1	Run No. 2	Run No. 3
2	Brick	2.11	2.40	1.55
6	Cast iron	1.18	1.38	1.41

The greater drop in air pressure through the brick recuperator is due mainly to the sharp turns around the ends of the baffles placed in the recuperator. The cast iron recuperator also has a distinct advantage over the brick recuperator in that its passages can be made of such shape and with surfaces smooth enough that the drop in air pressure through it will be less than can be secured in brick recuperators.

In both series of tests on continuous recuperative furnaces the efficiencies were highest when the largest size billets were handled. The following table gives the size of billets, radiation loss and efficiency for the series of tests on the two recuperative furnaces:

Furnace No.	Test No.	Billet size in inches	Radiation loss, per cent	Efficiency, per cent
2	1	3¼x3¼	16.48	62.18
2	2	3¼x3¼ and 2½x2½	14.54	63.07
2	3	2½x2½	20.84	58.29
6	1	2x2	20.74	47.30
6	2	2½x2½	13.18	57.41
6	3	½x2½	16.06	52.52

It will be noted that the series on the smallest size billets had the largest radiation loss. This may be due to improper operation or design. When operating with the smaller size, the billets heat more quickly and are at rolling temperature before arriving at the discharging end. This causes a higher average temperature of steel, roof and side walls inside of the furnace, causing the greater radiation loss.

The data here shown were obtained, as mentioned before, on furnaces using by-product coke oven gas as fuel, but the following recommendations for future development will apply in the main to furnaces using any kind of fuel. From the results shown in these tests, the development of heating furnaces should be along the lines of continuous recuperative furnaces unless some special reason makes it necessary to use another type. As has been shown the recommended type is superior to other types, as it is now built, and can be made even more efficient by development.

Table III

Heat Balance of Two Types of Furnaces

Furnace No.	Type	Per Test No.	Heat in Fuel Gas, per cent	Heat to Steel, per cent	Heat to Cooling Water, per cent	Heat in Stack, per cent	Per Heat Radiated
2	Continuous recuperative.....	1	100	62	1	20	17
2	Continuous recuperative.....	2	100	63	2	21	14
2	Continuous recuperative.....	3	100	58	1	20	21
5	Noncontinuous regenerative.....	1	100	38	..	27	35
5	Noncontinuous regenerative.....	2	100	41	..	27	32
5	Noncontinuous regenerative.....	3	100	37	..	31	32
6	Continuous recuperative.....	1	100	47	2	30	21
6	Continuous recuperative.....	2	100	57	2	28	13
6	Continuous recuperative.....	3	100	53	2	29	16

The furnace consists of a number of individual units, that is, roof, hearth, skids, burners, pusher, roof recuperator, main recuperator discharge and charging mechanisms, meters and regulators, insulation and water-cooled devices. These will be taken up independently and recommendations tabulated.

1. *Roof.* The roof should be placed at such a height above the steel that the gases may wipe both surfaces and yet not cause too much resistance to their flow. A flat roof eliminates the necessity of water cooling the arch supports. Some method of corrugation may be advisable to increase the surface for absorbing heat from the products of combustion. This would make available more heat for radiation from roof to steel and increase the rate of heat transfer.

2. *Hearth.* The hearth of the continuous furnace should be sloped from the charging end to the discharging end, care being exercised that the slope is not too great. This applies especially to long furnaces which are to handle large billets. The use of a basic lining for reversing furnaces would give a supply of basic cinder. This can be used in open-hearth furnaces to replace lump ore, and therefore deserves careful consideration.

3. *Skids.* Solid cast iron skids should be installed on the floor of the furnace, to eliminate the heat lost in cooling water and to simplify construction.

4. *Burners.* A series of burners should be installed across the width of the furnace in order to secure a uniform temperature. The burners should be equipped with valves for the independent control of both fuel gas and air for combustion.

5. *Regulators and Meters.* Each furnace should be equipped with some means whereby the gas and air pressures on the burners may be automatically maintained constant. Each furnace should be equipped with an intergrating and recording device which will measure accurately the amount of gas delivered to the furnace.

6. *Pusher.* A pusher for advancing the steel along the skids of the furnace should be provided which will give a uniform motion that can be regulated closely, both in regard to distance and speed. This mechanism may be actuated by either a hydraulic cylinder or a reversing motor.

7. *Roof Recuperator.* The use of a roof recuperator should be limited to that section of the roof in which the refractory property of the brick will not permit it to be insulated.

8. *Discharging and Charging Mechanism.* The side discharge which was explained in the description of the continuous furnace is superior to the dropping end discharge from a fuel standpoint. It eliminates the loss of heat due to the exposure of a poorly insulated surface to radiation from the hottest zone of the furnace, as it is impossible to properly insulate the swinging door on account of its construction and the abuse it receives. The side discharge admits less cold air to the furnace chamber and a side charging mechanism prevents to a large extent the leakage of air into the furnace.

9. *Main Recuperator.* The use of metal in recuperator construction has certain advantages over brick. It has a greater heat transfer rate and is not as susceptible to cracking with the consequent air leakage. The possibility of a design with the use of pipes or tubes similar to water boilers looks attractive.

The recuperator should be con-

(*Concluded on Page* 1206)

Industry Needs Power Economy

Plants Have Not Kept Pace with the Increased Demands Made During Peak Load Periods—Effort Should Be Made To Eliminate Wasteful Steam Plants—Electrification Appears Economical

BY E. F. ENTWISLE

FROM the inception of the human race, its development has been dependent on its knowledge of and ability to use power. The first manifestation of power was in man's own labor in caring for himself, then in using his power in making others work for him, then the gradually increasing realization that the blowing of the wind, the flow of water, the heat of the fire—all could be used in ways that outdistanced human effort and pointed the way to still greater possibilities of accumulated power. Civilization has progressed as sources and control of power have progressed and today we find virtually every line of human endeavor absolutely dependent on some kind of power not contained within the individual himself, every industry with power the very mainspring of its existence, and in innumerable cases furnished from a source over which the industry itself has no direct control.

From the beginning, the steel industry has had to depend on its own organization for its power, first in human effort in collecting its materials for reduction by natural combustion, then by further human effort applied to the bellows of the catalan forge, then by the application of water power, by the steam engine and the combustion of natural fuel for steam generation. Afterwards followed the first crude efforts at utilization of waste-gases in boilers and blast heating, working up finally to the direct use of the gas in the internal combustion engine, so that with the gradual development of the industry, there has been a parallel development in the industry's own power plants.

This has been true of necessity, for at the outset there were no adequate sources of, or means of transporting to the plant, the large quantities of power required, and long before any knowledge of electrical generation and transmission, it was recognized that the sources of power in the industry itself necessitated their utilization at the plant, so that we have today in every steel works a power plant, frequently in many units, generating in all of its several phases most of the power required to carry on the various operations from raw materials to finished steel products.

During comparatively recent years tremendous development has been made in the size, reliability and control of electrical apparatus for steel plant service and in the generation and transmission of the power required for its operation. Its almost innumerable applications need no recapitulation here, but they have been so general in character and large in total that in many cases the development of the plant's own power supply has not kept pace either in economy or size with the peak power demand, so that electric current frequently must be purchased to take care of these maximum load periods. It is only natural to expect that still further applications of power, both electric and steam, will be made in the ever constant development of the steel industry so that its power plant will become increasingly important.

How large a factor any one item is in steel manufacture is judged mainly by its percentage of the cost of the finished product. Knowledge of operating costs is essential to economic operation, and the steel plant cost sheets of the present day furnish the executive with the detailed information that enables him to analyze production costs. Every item, raw materials, labor, repairs, transportation, etc., and their relative importance to each other for various products, is constantly before him and his mind is always concerned in cost betterment, either through rendering labor more efficient, through price reductions, substitution of less expensive or of better materials, or through more economical use of the materials available. Unfortunately, however, power does not appear on our cost sheets as a single total item and we are apt to think of power costs only to the extent that they do appear as separate items of steam, electricity, water and air, not always remembering that power is the total of all of these, plus the additional power costs that are necessarily included in our cost sheet figures for example in raw materials for their handling, in partly worked materials, power for shops appearing as repairs, and many other auxiliary operations.

Fail To Obtain True Cost

The result is that the true cost of power is not generally fully appreciated, total power cost being defined as the cost of producing or purchasing all the energy for generating steam, electricity and blast furnace blowing. In such a cost, waste heat must be accorded a value commensurate with the value of the fuel that would have to replace it if the waste heat were not available. While it is true that the value placed on such waste heat is returned as a credit to the cost of the producing department, its real value must be set down as an item of power expense in order to fully appreciate how large an item power actually is in production costs and for a proper realization of the importance of its economic use. However, it is also important to know what portion of power costs occurs from such waste gas and heat charges, and it is advisable that these charges be so accumulated that their effect on costs can be properly judged.

The data submitted have been taken from the cost records of three Bethlehem steel plants and covers the period from January 1, 1920, to August 1, 1922. It is felt that this period is fairly representative of modern practice, 1920 being a year of good production, but with many war time prices and practices still continuing, 1921 being a year of low production and best possible economy, and 1922 being a period of increasing production with a continuance of improvement in the economies of 1921.

It is not necessary to repeat here the individual power consumption for various products, as we are interested primarily in accumulated power usage and cost. The accompanying tabulation shows the ratio of the cost of total power generation to the costs of some of the principal and more familiar items entering into production costs. From these figures have been eliminated all the effects of such pig iron and coke as were manufactured for shipment to outside customers, so that the data apply generally to any steel plant, the operation of which extends from coke ovens to finished steel products. In the first set of figures, blast furnace and coke oven gas and waste heat are charged to costs at full value. In the second block, all charges for such waste heat products have been eliminated and all power purchased is assumed to have cost the same as the power generated at the plant.

The importance of power as an item in production costs is sufficiently apparent from the accompanying tabulation. Any single cost item that, stripped of all credits, reaches the

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proportion of nearly one-fifth of the total plant pay roll, or five and one-half per cent of the total sales value of all manufactured products, or twice the cost of all refractories, commands attention. How to reduce it, and the extent to which it can be reduced, constitute the real economic question. Every plant is a problem in itself, and no definite formula can be laid down that is applicable to all. Different kinds of products, different degrees of finish, different seasonal demands and many other variables are considerations that necessarily must be taken into account in determining how much and in what manner power shall be generated. It is undoubtedly true, however, that comparatively few plants are in the position where their total power costs cannot be reduced and at the same time show a good return on the expenditures required to make the reduction.

Ratio of Power Costs to Production Costs

	Including value of By-Product Gas and Waste Heat		Not including any value for By-Product Gas and Waste Heat and with Total Power Consumption figured at Plant producing cost	
	A	B	A	B
Ratio of total power cost to delivered cost of all coal for coking	0.82	0.60	0.60	0.28
Ratio of total power cost to delivered cost of all gas, coal and oil	1.67	0.64	1.22	0.30
Ratio of total power cost to delivered cost of all ore	0.65	0.60	0.48	0.28
Ratio of total power cost to delivered cost of all limestone	5.35	2.40	3.90	1.10
Ratio of total power cost to delivered cost of all alloys	2.45	2.16	1.80	1.00
Ratio of total power cost to delivered cost of all refractories	2.70	2.98	2.00	1.40
Ratio of total power cost to total ingot cost	0.138	0.142	0.101	0.065
Ratio of total power cost to total plant pay roll	0.255	0.230	0.187	0.106
Ratio of total power cost to sales value of all finished products	0.071	0.080	0.052	0.037
Horsepower hours consumed per ton of shipments	286	242	286	242
Kilowatt hours (including equivalent of blast furnace blowing) consumed per ton of shipments	256	516	256	516
Per cent of blast furnaces blown by gas engines	100	100	100	100
Per cent of Item 10 generated by waste products	39	68	39	68
Per cent of Item 11 generated by blast furnace gas	78	72	..	..

In general there are three points of attack on the problem after the cost analysis has been made; first, on the prime movers of mill and auxiliary drives; second, on the electric generating and blast furnace blowing plants; and third, on the steam plants.

For new installations there is little room for argument against electrification as showing the greatest economy. For existing steam-driven units practically every case will show a fair return on the investment by the substitution of electric drive, including the generating equipment. Some improvement can often be shown by the substitution of more economical types of steam drives, but aside from other considerations, it is obvious that the tremendous handicap of the miles of steam piping required for a steam operated steel plant imposes a burden on the steam drive which it cannot carry in competition with the electric drive.

It is not contemplated in this paper to discuss the relative merits of the types of drive for this service. Sufficient to say that, in general, steel works have not taken full advantage of the economies possible. The power plants are often scattered in a number of separate installations and the overall efficiency of all power generation is not nearly the possible maximum. Usually the maximum operating load can be carried only by putting uneconomical units into operation, or by purchasing power from an outside source.

In the steam plant usually can be effected the greatest economies and greatest savings. Steam plants are even more scattered than the electric generating plants. They are nearly always old and in small capacity units. It is probably safe to state that eighty per cent of steel works blast furnace gas fired boiler plants have no legitimate excuse for existence, and many of the coal burning plants are but little better. Steam lines should be eliminated wherever possible, and where they must exist, should have the fullest protection and attention to minimize condensation and leakage losses.

Keeping these three general points in mind it is interesting to return momentarily to the tabulated figures, particularly the last seven items, inclusive, as they illustrate to some extent the possibilities referred to.

A is the average of plants in which power requirements are about evenly divided between steam and electricity, and B is a plant which is, primarily, motor driven. While the nature of the products from plant B requires nearly twice the quantity of power per ton than do the products from A, B's power bill per ton is scarcely greater than A's, due to its more extensive recovery of power, proportionally, from its by-product gas and waste heat, and in spite of the fact that 28 per cent of its total electric power must be purchased at a unit cost of about four times its own generating cost, all of its own power being generated by gas engines. Plants A purchase 14 per cent of their electric power consumption. Improvements now under way at B will eliminate this excess burden, and a truer comparison of the accomplishment possible may be seen in the second block of figures, in which gas and waste heat charges have been eliminated and the power now being purchased figured at plant producing costs.

Further reductions in this plant's power costs may be made through the replacement of its existing boiler plants, and it is safe to say that this plant, or any one similar in equipment and power requirements, can reduce its total power bill, eliminating all charges for by-product gas and waste heat, to about 5½ per cent of its total ingot cost.

Returning to the general question of economic importance of the steel works power plant, there are a number of still unmentioned items that must not be overlooked. The investment necessary to accomplish the savings that are shown to be possible by such a detailed analysis is very often a large one and very often the amount is so large that the same investment in added steel capacity, or a different line of product, will yield a larger return than will the power plant. Such a condition very often occurs, and where expenditures must be limited, the power plants have suffered in consequence. It must be borne in mind, however, that every plant addition increases the power plant's responsibility, and while the return may not be of the highest, it is sufficiently attractive to warrant the expenditure, and economically the right thing to do.

The power plant is linked economically with the utilization at highest efficiency of all the by-products of the industry and the plant that strives only to utilize sufficient of its energy producing by-products to carry its own power load is looking backward, not forward. Electric power has become of such tremendous importance to the every-day life of our country and its uses are constantly multiplying to such an extent that probably none of us fully realize the power demands of tomorrow. Our country's general system of power generation

(*Continued on Page* 1205)

Use of Electric Furnace Expands

Refining and Melting Iron and Steel Electrically, Although Development of Last Decade, Continues To Grow—Half of World's Furnaces in United States—First Principles of Operation Unchanged

BY JOHN A. MATHEWS

THAT this year, 1922, marks the tercentenary of iron making in the Western Hemisphere seems to have been generally overlooked by the steel trade. In 1622, the first iron was made at Falling Creek, Va., and in the same year, the plant was destroyed and the workmen massacred by the Indians. It is a far cry from charcoal hearths and forges to the consideration of the electric furnace—the latest development in steelmaking processes.

The earliest literature of electric melting of iron and steel dates back but a score of years and was provided by the inventors of various furnace types. It is characterized by the enthusiastic optimism of the inventor and on that account may not have been considered seriously by conservative, practical steel men. Their confidence in electric furnaces may not have been greatly increased during the next few years by the writings of those who made the earliest installations. They may have felt that there was something of the child-with-a-new-toy air about them, and that both inventors and early users were overstating the case and that time and further experience might change matters. The war needs stirred some of the doubtful to action and furnaces were installed in great numbers, particularly in the years 1917 and 1918. So rapid was the introduction of electric furnaces at this time that the writer felt constrained to utter a word of caution in a previous paper before this institute when he said: "We will pass through a period of reaction and dissatisfaction with electric products while many of the new furnaces are in the experimental stage."

Operators Must Be Trained

This opinion was based upon the fear that furnaces could be built faster than skilled operators could be trained. The author now feels that these fears were justified by the experiences of the war period, for much electric furnace product was not what it should have been, and possibly not as good as much of the open-hearth product made during the same period. He has always discouraged the idea that the electric furnace was a fool-proof and automatic process for making superior steel by those unskilled in steel making.

It is believed now that the period of disaffection is past and that the 16 years of experience, since the first electric furnace was installed in America at the Halcomb Steel Co., have been sufficient to afford a sounder basis of judgment than may have been afforded by the earlier literature already mentioned. There are now nearly 1000 electric furnaces in America and Europe, not quite half of them being in the United States and Canada. Constant interest in these developments from the beginning leads to the conclusion that the pioneer writers were not overenthusiastic and that their claims and predictions in general have been fulfilled.

Italy Ranks Second in Production

It will be a surprise to many to know that Italy has about 180 electric furnaces for steel melting, that 27 of them are from 15 to 25 tons capacity, and in 1921 her tonnage of electric steel was second only to that of the United States, reaching a new high mark for that country. The annual productive capacity there is about 1,000,000 tons. Doctor Giolitti recently stated that some of these furnaces were operating at unusually high speed and with great economy of electrode consumption, as low as 6½ pounds per ton for cold melting. For installed capacity, Italy ranks ahead of Germany, England and France, and second only to the United States.

The rapidity with which electric furnaces have been installed within the last decade all over the world calls for some analysis as to the cause. After 10 or 12 years of invention and pioneering there were about 125 furnaces in the world in 1912. At this time, Germany led with nearly one-third of the total number. Today, as nearly as may be estimated, there are 1000 furnaces, 388 of them being in the United States, according to the figures for Jan. 1, 1922. Accurate statistics have been extremely difficult to secure during late years, but according to Dr. Richard Amberg there are 65 furnaces in Germany engaged in the manufacture of ingots, with a yearly productive capacity of 430,000 tons and an unknown number of furnaces making steel castings with a capacity estimated at 300,000 tons per annum. We may estimate the total number of electric furnaces in Germany as about 100 to 110.

Causes of Furnace Expansion

The reasons for the world-wide expansion of electric steel making are three:

(1). Cheapening of wholesale power rates, due to hydroelectric and improved steam plant developments. Thus it is now commercial to use electricity for melting, whereas the original promoters of arc furnaces felt that their use would be of necessity confined to refining of metal premelted by the older processes.

(2). The extreme flexibility and adaptability of electric furnaces to a wide range of uses. It has been shown by experience that they may be used successfully for melting cold charges or refining liquid charges, for making ingots or castings and for melting ferroalloys. They may be used alone, or in conjunction with the bessemer or open hearth, or both. They may be operated acid or basic. They may be used in conjunction with the blast furnace or cupola for making gray iron, malleable and semi-steel castings. For foundry use particularly, the small units are advantageous for making frequent small heats of steel or iron castings.

The most popular size of electric furnace in this country is of 6 gross tons capacity, but furnaces from one-half to 40 tons capacity have proved equally successful. In furnaces of 6 tons, or a little larger, hand charging in general; but in the larger sizes either mechanical charging of cold materials or the use of hot metal charges is usual. Duplexing of open-hearth steel is practiced in many of the larger units, while triplexing is done at the great installation at the Illinois Steel Co. as described at the institute a few years ago by T. W. Robinson. This paper was published

From a paper presented at the New York meeting of the American Iron and Steel institute, Oct. 27. The author is president, Crucible Steel Co. of America, New York.

in the June 6, 1918 issue of IRON TRADE REVIEW, pages 1432.

All of the manifold methods of operation are possible with the use of arc furnaces, which are by far the most frequently used, here and abroad. Of the different types of arc furnaces in the United States nearly one-half are of the Heroult type and considerably more than one-half of the productive capacity is represented by them.

The electric furnace has small possibilities in this country for the manufacture of pig iron from the ore, but during the war period several furnaces were used to make so-called synthetic pig iron from turnings and borings and other light scrap, in the United States, Canada and France. In Sweden, Norway and Italy, where metallurgical fuel is dear and electricity is cheap, electric smelting of ores is an established industry. The world's production for 1921 is placed at 377,900 tons, and it will be recalled that the year 1921 was not a good year for high records.

(3). Quality of products. A new process to succeed must be cheaper in operation or produce a better quality. The cost of electric steel rarely is lower than open hearth and never lower than bessemer; therefore its success presumably is due to its producing a generally superior product. Of course there are especially favored localities or peculiar market conditions which warrant the installation of small electric furnaces where open-hearth and bessemer installations would be out of the question. In the same localities and markets electric furnaces do operate successfully alongside of large tonnage plants and under such conditions quality must be the principal reason for success rather than low cost.

Provides a Reducing Atmosphere

It is obvious that this country has not installed 1,500,000 tons of productive capacity to compete with the present crucible capacity of one-tenth that volume. In an address several years ago the author said: "It is seldom that a process is discovered that cannot be improved upon. Crucible steel is an exception to this rule. This earliest process makes the best steel and never has been surpassed." The superior lasting qualities of German guns often was ascribed to the use of molybdenum, zirconium, uranium or other strange alloys, but the writer's idea is that the use of clean, well-melted crucible or electric steel is a more probable explanation. Crucible steel was employed for many submarine crankshafts, and apparently the Germans recognize that when fabricating and machining costs are far in excess of material cost, and where dependability is a vital necessity, it is a poor policy to save at the spigot and let out at the bunghole. Quality depends upon the selection of raw materials, the process of melting and subsequent care in forging and heat treating. The electric furnace provides a reducing atmosphere in which sulphur is removed readily and with it goes one of the generally recognized inclusions, manganese sulphide, and the same condition serves to eliminate oxides.

The electric furnace, therefore, is a potential source of clean steel which is more highly appreciated than formerly, and the electric product is opportune to meet the new and exacting requirements for ordnance, automobiles and airplanes, and other devices in which alternating stresses are severe. The importance of clean steel has been observed in the course of extensive investigations of the fatigue of metals under the direction of Prof. H. F. Moore. It is not too much to expect that the higher the elastic or proportional limit resulting from heat treatment, the more serious would become defects such as nonmetallic inclusions and seams in parts made from inferior steel. Doctor McCance confirms this in stating that fatigue failure under repeated stress is a progressive failure, starting in all cases in some defect or irregularity either of internal structure or external surface.

By way of illustrating the freedom from inclusions in electric steel, might be mentioned the result of actual count of hairlines, due to inclusions, in the ground surface of steel to the same chemical specification — a chrome-nickel steel for airplane crankshafts. As the result of tests on several heats of this steel by the basic, and acid open-hearth and basic electric process, the average count ran in the ratio of 8 to 4 to 1, and the hairlines in the electric steel were much shorter than in the steel of open-hearth manufacture. Another illustration from experience may be convincing. In one of the races at the Indianapolis speedway a few years ago, about one-half of the cars starting did not finish because of failure of vital parts. The following year nine or ten cars, which contained our electric furnace product in their important parts, all finished the race without mishap, and included the winning car. A practical demonstration of this kind is more eloquent than columns of figures of laboratory tests.

The recent paper by W. J. Priestley outlines the splendid results of electric furnace ordnance steels made at Charleston, W. Va., in the largest furnaces in the United States. He shows that the results are due to clean steel and freedom from oxides, sulphur and phosphorus. These results show that large units, with proper handling, can produce high quality steel, and we see no reason, now that larger electrodes can be made of dependable quality, why a 60 or 80-ton furnace cannot be expected to give relatively as satisfactory results. The electric steel rail is still a desired possibility. The increased demands made upon materials of construction call for new methods for meeting those demands. As stated here six years ago, the electric furnace was opportunely invented to meet a new demand rather than to replace an old process.

Heating Principles Unchanged

It would be mere repetition to restate here the various types of furnaces, such as arc, induction, radiation, etc. They have been described in books and technical magazines and we need only observe in passing that there have been no new principles of heating employed since the first few years—with the possible exception of Doctor Northrup's high frequency induction furnace which has not thus far been employed successfully in units of commercial size in the steel industry. Of mechanical and electrical refinements there have been many, all in the nature of improvements in regulation and economy. Among these may be mentioned two of American origin, J. A. Seede's automatic electrode regulator, and E. T. Moore's peak-load regulator.

The principle of dual, or rather multiple, voltages was embodied in our original installation in 1906, but its metallurgical significance was not so apparent as it was later when we installed a process employing a 220 volt arc and with considerable difficulty succeeded in persuading the inventor that provision for a lower voltage for use during the refining period must be provided. The desirability of relatively high voltage for melting and low voltage for refining now is generally recognized. Many improvements have been made as the shortcomings of the earlier furnaces appeared, such as well-fitting doors, water-cooled arches, better electrodes and holders and economizers to cut down oxidation and waste of the elec-

trode. The author has seen electrode costs per ton of product as high as $8.00 gradually decline to 35 cents. This was in a furnace refining molten charges.

The electric furnace is also a recognized factor in melting nonferrous alloys, such as brass and monel metal, as well as special alloys such as stainless steel, manganese steel and high-speed steels, besides an endless variety of the simpler alloy and carbon steels from the mildest to the hardest tempers. As stated earlier in this paper, its astonishing flexibility—versatility, we might call it—has attracted the attention of the metallurgical world in almost every branch of smelting, melting, refining, heating and even baking metals. To those of us who have watched its growth from the start, it seemed slow in achieving the recognition we felt must inevitably come to it, but at last our early confidence has been confirmed in every steel-making country, because its products have fulfilled almost every expectation in every field wherein it has been tried thoroughly. The present success is due not only to the original inventors of the basic processes but also to the active co-operation of the great manufacturers of electrical equipment, furnace designers and builders, makers of refractories and electrdes and a group of earnest metallurgists in many individual plants who have studied every detail of operation.

When users acquire a full appreciation of what clean sound steel means in terms of national efficiency, safety and economy we shall see more rapid growth than has as yet been seen. Its usefulness to engineering and industry has just begun.

Selection of Proper Steel for Automobiles

(*Concluded from Page* 1194)

indicated in the preceding paragraphs that the merit of a steel for automobile use was closely related to the results of the tension test; and that this relationship might be expressed by the proportion:

$$\frac{\text{Mean breaking strength} \times \text{Elongation}}{K\text{—Reduction in area}}$$

It is perfectly obvious that such a simple proportion as the above can in no way be an exact statement of the really complex relation which exists between the phenomena occurring in the tensile test and the exceedingly complex combinations of properties required for our various parts. Nevertheless, since this test so greatly influences the automotive manufacturer, in his choice of steels, we are justified in considering what further information it can supply us with.

The physical properties of our steels are direct functions of the drawing temperature. Thus the elastic limit, elongation and reduction in area may all be varied over wide limits by heat treatment. It therefore follows that our merit number, as previously computed, will also change in value according to changes in the drawing temperature and will in a given steel be a maximum at a definite temperature.

Heat Treatment Important Factor

For example, a hardened but not drawn bar of high carbon steel may show an elastic limit of 175,000 pounds per square inch. Nevertheless, it can be seen readily by breaking the bar with a hammer that this strength is of little use for the part under discussion. Due to the slight elongation and reduction in area possessed by the bar, these factors in our equation will be small and our merit number will be low, in spite of the relatively high elastic limit. If we now reheat or draw the bar, we find that although of less strength as measured by elastic limit, it will easily withstand our efforts with the hammer. A further increase in temperature still further increases the amount of energy which must be expended before breakage occurs, until a maximum point is reached where the decrease in tensile strength and elastic limit is not compensated for by the corresponding increase in elongation and reduction in area. Further elevation of the drawing temperature beyond this point results in a decrease in merit until the critical point is reached, with its accompanying fundamental changes in qualities. This drawing temperature at which maximum merit occurs is different in different types of steel and is fairly independent of the carbon content. This consideration is important in comparing the suitability of the various steels for different uses and in defining our practice in allotting a particular analysis of any given type of steel to a particular part.

Thus we find that the steels in which this temperature of maximum merit naturally is low are used exclusively in the condition resulting from low drawing temperatures. This is the case with silico-nickel steels which are widely used for hard light armor plate. Our most widely used spring steel is of an analysis which develops the necessary spring requirements of strength, etc., at a drawing temperature but 60 degrees removed from the temperature of maximum merit for that steel.

It is common practice in the manufacture of large carbon steel forgings to meet the elastic limit requirements in so far as possible by carbon additions and thus maintain a high drawing temperature. Since there is, then, a definite drawing temperature, at which the dynamic properties required in automotive steels are developed to their maximum, for each particular steel analysis, there is, consequently, a corresponding definite elastic limit for the use of that steel.

Most of our major automotive parts require, owing to the limitations imposed by design, minimum strengths of a relatively high order. Also the successful operation of these parts, under the difficult service conditions, presupposes the development of the merit index to a high degree.

Carbon steels may develop under suitable heat treatment elastic limits which are sufficient for most of these parts, but their use is promptly excluded where the requirements exceed 80,000 pounds per square inch, and even for requirements under this figure the merit index is of a lower order than is desired. Accordingly, our automotive alloy steels have been developed, which not only will show higher elastic limits than those obtained in carbon steels, but also for any given elastic limit demanded by design, will exhibit resistance to fatigue, vibration, shock and wear, far greater than that of any carbon steel.

This development has been coincident with and in a large measure responsible for the development of the automotive industry. The commercial factors, as defined by the adaptability of these materials to the various mill processes of manufacture and the subsequent operations of fabrication such as machinability and general adaptability to shop conditions, have in a like manner been improved until it may now be fairly said that through the use of alloy steels, the automotive manufacturer can build a better product at a cheaper price.

Industrial Power Economy Is Needed

(*Continued from Page* 1202)

from coal mine to delivered power has an inefficiency that cannot indefinitely be tolerated, and we are undoubtedly not far from the day of the super-power transmission system, possibly under public service control similar to our rail transportation systems, and under which no industry

with power producing by-products may escape the responsibility of contributing to the general power system. Such an institution will ultimately result in economies to all industry, in reduced cost of power, and to the steel plant particularly, in solving the problem of the best means of supplying the widely separated peaks in both directions, of power demands and supply. Public interest in smoke prevention simply as a convenience has forced economy on many an industry, and the power situation of today offers a similar opportunity but with the additional weight of public necessity rather than mere convenience.

We cannot help but realize that steel plant operation cannot be, and is not, carried on under the wasteful methods that were common practice not so many years ago. We acknowledge our responsibility in the happiness and welfare of our employes, we acknowledge our responsibility in the economic structure of our immediate communities and of the country, and we cannot be blind to the fact that the not far distant future will impose on us, and rightfully, the problem of converting at highest efficiency all of our waste products into power, to the end that all industry may be benefited by the surplus power thus made available and protected by the resulting conservation of our natural fuel supply.

Heating Furnace Used to Conserve Fuel

(*Concluded from Page* 1200)

structed so that it offers the least resistance to the flow of air and gas consistent with good heat transfer. The gas and air passages should be designed so as to give as nearly uniform velocities at all points as is possible. That is, the variations in the volume of gas and air due to their varying temperature should be considered. It may be advisable to have the air flow through three banks of tubes in series with the waste gases passing over the outside. The tubes should be staggered to give the maximum heat interchange.

The recuperator should be located in such a position that it would be easily accessible for inspection and repair. Placing the recuperator above the furnace instead of under ground should be carefully considered. A better distribution of the waste gases both through the furnace and in the recuperator would be possible than is the case where the entrance to the recuperator is directly below the steel to be heated, since the gases must pass over the ends of the billets. Additional insulation would be required but no drainage water could collect in the bottom of the chamber or flues.

10. *Insulation.* Insulation should be used to prevent radiation as far as is possible without reaching the refractory limit of the fire brick and yet remain under the point where first cost would overbalance economy.

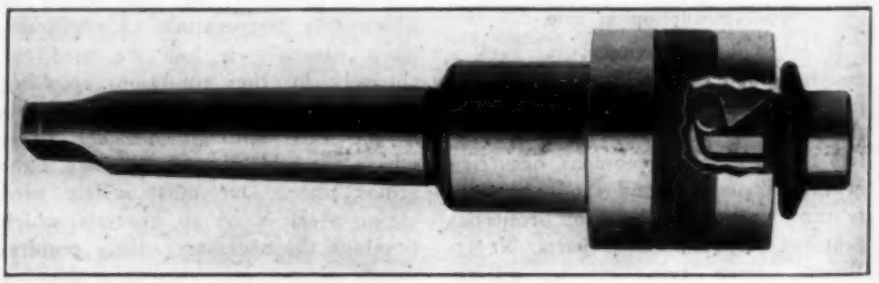
11. *Water-Cooled Devices.* Water-cooled parts should be avoided wherever possible, because they are hard to keep in repair, dissipate an appreciable amount of the total heat of the gas, and their elimination reduces the cost of supplying the cooling water.

12. *Waste Heat Boilers.* Several installations of waste heat boilers have been made in connection with heating furnaces. However, the development of the recuperator holds such possibilities that furnace efficiencies comparable to good boiler practice should be obtained. Future development, however, may show that in some cases of noncontinuous regenerative furnaces the waste heat boiler may have a field.

It will be observed that heating furnaces have been brought to a fair degree of development. The efficiencies obtained are not comparable to those of the best heat interchanging appliances, such as boilers and blast furnace hot blast stoves. With the rapidly increasing cost of fuel in this country, it becomes important that all heat using appliances be made as efficient as possible, and concerted effort along the lines of recuperative furnaces should be productive of material savings in fuel.

Simplicity Is Feature of New Tool Chuck

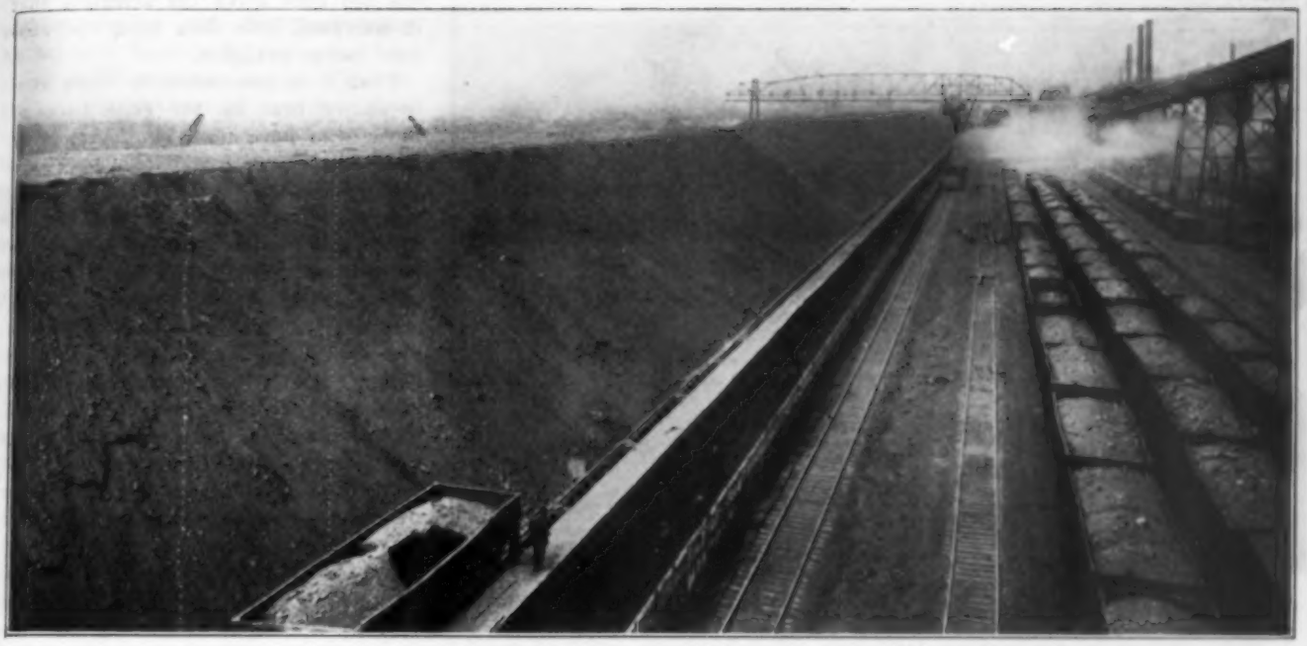
Time required for the change of drills, reamers and other tools, is saved by a quick change chuck brought out recently by the McCrosky Tool Corp., Meadville, Pa. This chuck, as shown in the accompanying illustration, consists of only two main parts, a driving body with a Morse taper shank to fit the drill press spindle and a slotted collar to hold the collet up in the driving body. The collar is straight and uniform in shape and is hardened all over. The bayonet locking slots in the collar that admit the driving lugs of the collet are so designed that the collet can be inserted or released with one hand, and without slowing or stopping the machine. To insert a tool the operator has only to push the collet into the revolving chuck, where it is locked in place by the positive automatic lock. To release a tool, a slight pressure of the thumb and forefinger on the knurled collar of the chuck releases the collet and allows it to drop into the operator's hand.



A QUICK CHANGE TOOL CHUCK WHICH CONSISTS OF ONLY TWO PARTS

Division of Engineering Publishes Booklet

The division of engineering of the National Research council has just issued a booklet giving information about the work done by the division, its personnel and organization. The National Research council is a cooperative organization of American societies and scientific men concerned with the physical, mathematical and biological sciences, and applications to human welfare through agricultural, engineering and medical arts. The main offices of the society are at 1701 Massachusetts avenue, Washington, while the division of engineering has its offices in the Engineering building, New York. The division of engineering aims to carry out the general purposes of the council in the field of engineering by stimulating research, coordinating the work of existing agencies, concentrating scattered efforts and making the knowledge gained more accessible. The division plans programs for the projects brought to it or proposed by it, aids in the organization of interested groups, finds men and means of carrying on the work and co-ordinates the efforts of societies, industries, government bureaus, universities and individuals. The results are published in the journal of the engineering society interested or in the bulletin of the council. The last part of the booklet is devoted to the by-laws and officers of the division.



Coal Storage System at the Gary Coke Oven Plant of the Illinois Steel Co.

Storing Bituminous Coal Safely

With Precautions as to Piling and Draining, Large Quantities May Be Accumulated—Fire Danger Is Lessened as Storage Methods Are Studied—Weathering Tests on Coking Coals Show Deterioration Is Slight

BY H. H. STOEK AND J. V. FREEMAN

WITH the coal resources of the United States widespread and distributed through three-fourths of all the states, with ample coal resources located within a relatively short rail haul of most of the industrial centers, with a potential producing capacity in mines of at least 50 per cent more than the present requirements of the entire country, with many of the large users of coal owning their own coal mines and thus being independent of the ordinary competitive conditions of supply and demand, the question may fairly be asked, "Why store coal?"

From the standpoint of the user of coal, storage is an insurance measure and like all insurance, a wide divergence of opinion exists as to how much insurance should be carried and what is the best way to carry it. No one questions the necessity for fire insurance, and compensation insurance in most states is no longer a voluntary matter. It is not without the bounds of possibility that insurance against a shut-down of industrial plants, due to lack of fuel, may become one of the prescriptions, although to date this is one of the few forms of regulations that appear to have been overlooked.

Selecting the System of Coal Storage

IN THE choice of a storage system the following points should be considered:

1. *The location, size, and topography of the available storage ground.*
2. *The capacity of the desired installation, that is, the amount of coal which it is desired to load and unload in a given time.*
3. *The cost of the plant.*
4. *The cost of maintenance.*
5. *The cost of operation.*
6. *The amount of breakage to be permitted in handling the coal.*
7. *The way in which the coal is received, in open or box cars, or in boats.*
8. *The length of time the coal must be kept in storage.*
9. *Climate: Underwater storage is impracticable for a part of the year in some of the colder sections of the country, such as Duluth.*

The iron and steel industry is interested in coal storage from a number of different standpoints. The industry consumes about one-fifth of the bituminous coal produced in the United States, that is about 100,000,000 tons per year, exclusive of subsidiary railroad requirements, and represents a yearly expenditure of at least half a billion dollars. Anything that has to do with this item of expense, which has steadily increased during the past few years, is worthy of the most careful consideration.

A large stockpile of coal of any industrial company is always looked upon with envious eyes in time of shortage and may be commandeered upon short notice, so that the large industries therefore should be interested in developing a sentiment for the storage of coal by the domestic user. General reasons for the purchase of greater amounts of coal during the spring and summer months than are needed for current consumption briefly are as follows:

1. To assure the consumer an adequate and continuous supply which protects him against strikes, other labor disturbances and uncertain railroad deliveries.
2. To take advantage of water

From a paper presented at the New York meeting of the American Iron and Steel institute, Oct. 27. Of the authors, H. H. Stoek is professor of mining engineering, University of Illinois, Urbana, Ill., and J. V. Freeman is director of coal and coke research laboratory, United States Steel Corp., Joliet, Ill.

STORAGE YARD AND HANDLING EQUIPMENT OF THE INTERNATIONAL HARVESTER CO., SOUTH CHICAGO, ILL.

transportation and the low freight rates.

3. To secure the advantages of low prices.

4. To equalize the prices on different sizes of coal.

5. To avoid the maintenance by the railroads of equipment that is used for only part of the year.

6. To maintain a uniform rate of production at the mines.

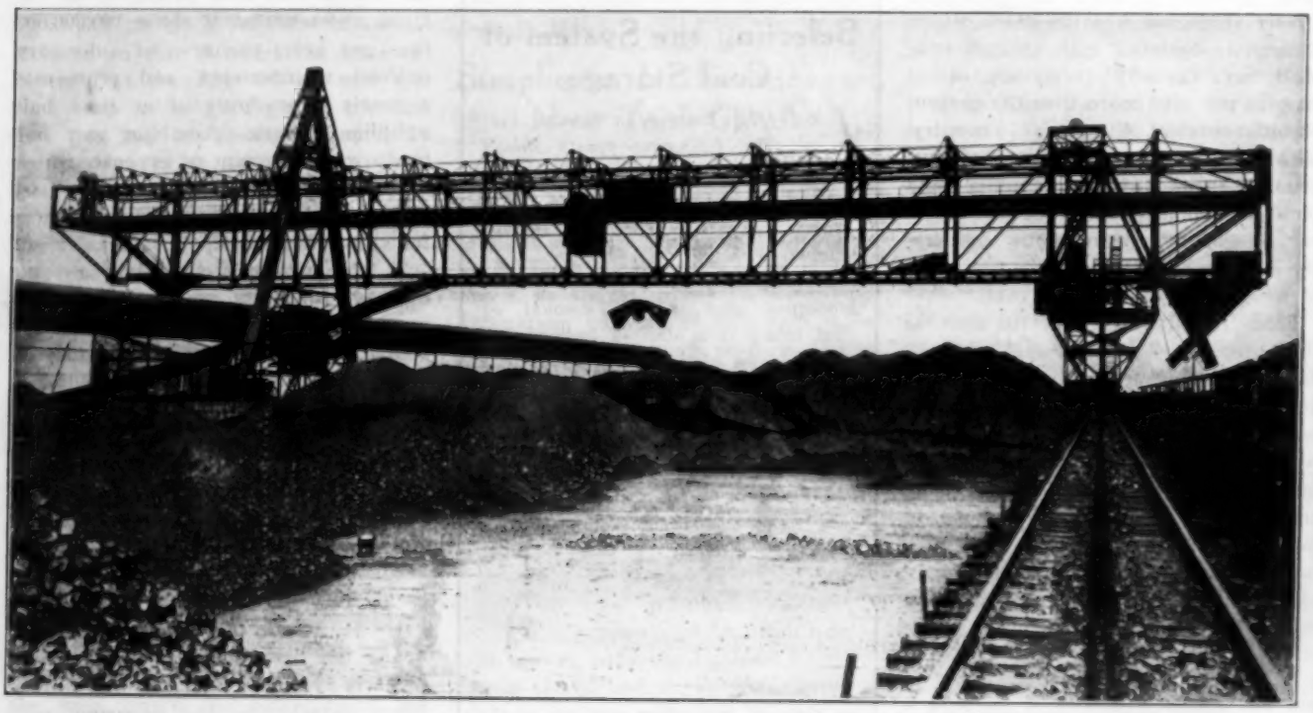
Admitting that storage of coal as a stabilizing element in connection with the coal industry has been by some unduly stressed, all must admit its importance. The greater the uniformity in the production and transportation of coal, the less the amounts necessary to be kept in storage and the less the taxes and interest charges on the storage piles. Hence, while the insurance factor always will require a storage pile, a stabilizing of the mining and transportation of coal should decrease materially the amounts of coal necessary to be kept in storage at the steel plant and lower materially the interest and tax charges upon coal kept even for a few months. This is a phase of the subject that has not been given the attention that it warrants, little data upon the subject being available.

That it is practicable to store coal is shown best by the experience of those who have tried it. Every year hundreds of thousands of tons are stored along the Great Lakes for distribution through the Northwest. All of the by-product coke plants store large quantities and also many of the public utility companies and manufacturing concerns. Failures have been recorded, but an investigation of these failures nearly always has shown that in the storage the vital and fundamental principles have been neglected. One of the largest and most successful storers of coal has been the Commonwealth Edison Co., Chicago. In a recent article John M. Glenn, secretary, Illinois Manufacturers' association, states that the Commonwealth Edison Co. at the beginning of the recent coal strike had about 500,000 tons of bituminous coal in storage and when the strike officially ended in August, 176,000 tons were still on hand.

Disadvantages of Storage

Therefore, if coal storage is advisable and practicable, what are the disadvantages of it and why is it not more general? The objections usually offered may be summarized under two heads: Financial considerations, and the physical and chemical changes in the stored coal.

That it costs to store coal goes



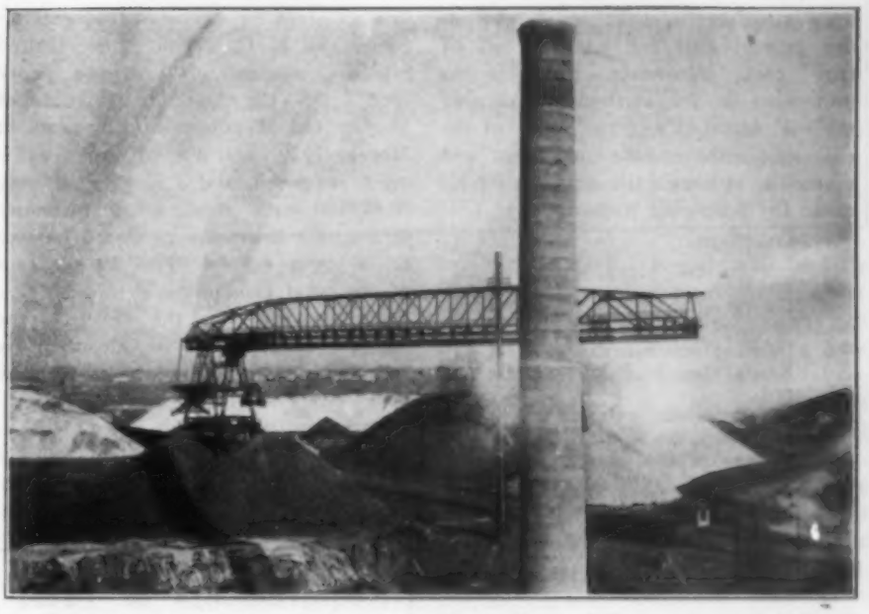
THE INLAND STEEL CO., INDIANA HARBOR, IND., UTILIZES A BELT CONVEYOR AND BRIDGE FOR UNLOADING AND STORING COAL

without saying and this cost must be balanced against the insurance features. It is probable, however, that if storage practice can be stabilized and extended so that the benefits of it may extend to coal transporting railroads and producing mines, stored coal may become self-supporting as a result of differential freight rates and cheaper production costs during the present slack seasons of mining.

If, as is commonly assumed, storage of coal will prove of benefit to the coal producer, transportation company and user of the coal, any increased cost should be borne jointly by these three interests and it should not be expected that the user will pay for all of it. The producer must expect to compensate the user if storage by the latter permits a less mining cost, and, likewise, the railroad if it can haul coal more cheaply during the summer should expect to give a decreased freight rate. As one result of the stabilization conference held in New York in March, 1920, a bill was presented to congress, but not passed, authorizing a differential freight rate on coal hauled for storage purposes during the summer months.

In the fall and winter months the railroads are moving the crops and the greater part of the consumption of coal. In April the movement of coal falls to a third of what it was during the winter months due every alternate year, of course, to a strike or shutdown. The amount transported shows substantial increases month by month until September, when the fall movement of domestic coal is at its height, thus the greatest tonnage is moved when the cost of moving freight per ton mile is considerably greater than during the summer months. For instance, in the summer it takes eight days for a coal car to make a round trip between Springfield, Ill., and Chicago, while during the winter months it takes twice as long. Labor, motive power, wear and tear are all increased and equipment earns only half as much. It is unfortunate, from the railroad's standpoint, that it must handle the bulk of its coal tonnage during the fall and winter, while in the summer, due to lack of business, a large part of its coal car equipment stands idle on side tracks. This condition applies particularly to Illinois, but in some sections as, for instance, Western Pennsylvania, Ohio and West Virginia, where much of the coal is sent over the lakes to the Northwest, the summer season is the busy one both for the mines and the railroads.

Figures as to the cost of storage are hard to obtain as few companies



A VIEW OF COAL STORAGE YARD AND COAL BRIDGE OF AMERICAN STEEL & WIRE CO., CLEVELAND

A 10-TON BRIDGE TRAMWAY FOR HANDLING COAL TO AND FROM STORAGE AT THE NATIONAL TUBE CO., LORAIN, O.

keep a storage account separate from the general cost for handling all of their coal. Moreover, there is no uniformity in the methods of keeping the coal accounts and too many of the costs published include only labor and materials, although the cost should include the following items:

1. Overhead.
2. Labor.
3. Supplies.
4. Depreciation of mechanical equipment.
5. Interest on investment.
6. Rental on land on which coal is stored.
7. Insurance on equipment.
8. Insurance on coal.
9. Taxes on coal in storage.
10. Decreased value of the coal, if any.

In 1918, the writers attempted to gather costs of storing and reclaiming coal under the above heads and the figures reported varied from 10 to 54 cents per ton with no certainty in most cases as to what items were included in the totals given. Another attempt to gather similar statistics during the past summer met with like results. At the present time we believe that a minimum of 25 cents per ton should be counted on as a charge against coal in storage and in many instances it is undoubtedly more.

To store 100,000 tons of coal in a pile of 40 feet high requires at least three acres of ground space without allowing room for tracks and operating machinery. Rental on this ground may be a material item. Storage of 100,000 tons in Chicago at present represents an investment in coal of about $500,000. Interest and taxes on this investment should be considered but usually are not.

The storage of from 5 to 10 per cent of the total output of anthracite at the upper Great Lakes ports in order to take advantage of water transportation during the summer, and near the seaport and the mines, as a reserve supply, have increased summer buying for domestic use, which has been stimulated by a decreased price. This storage did much toward equalizing the monthly production of anthracite. Although the storage of anthracite and of bituminous coals are by no means parallel, and while there are problems and also certain difficulties that must be overcome in connection with bituminous coal storage that do not apply to anthracite, it is feasible to store bituminous coal in such large quantities as will provide relief for coal operators, mines and railroads by stimulating production during the summer months. The monthly fluctuations in coal production as given by Director George Otis Smith and F. G. Tryon of the United States geological survey, in a paper read before the American Institute of Mining and Metallurgical Engineers in March, 1920, are not as great as is often supposed, and a shifting of only 50,000,000 tons from winter to summer would cause the production curve to be quite regular. This 10 per cent of the total production should be easily transferred from the winter to the summer months and be absorbed by the various industries that will be benefited.

Irregular working, in the form of idle days and short days due to lack of demand, shortage of railroad cars, labor trouble, etc., mean, of course, increased cost of the coal produced during the working time, but this fact is difficult for the general public, that buys the coal, to grasp. The late Francis S. Peabody testified before the Frelinghuysen committee in 1918 that mining costs varied as much as 50 to 60 cents per ton from month to month, due to the difference in the number of hours that the mines worked. Irregular employment of the miners undoubtedly begets irregular habits and a disinclination to work full time even when there is an opportunity to do so.

As coal is by far the largest item in the freight hauled by the railroads, irregularity in the amount hauled in different months means excessive equipment and disorganization of schedules, as well as the increased cost of hauling during cold weather. The effect of irregularity on the consumer, of course, is increased cost of the coal as he must support the miner for the full year, even though he works only 200 days. He must compensate the operator for his excessive overhead and idle time items and must pay the railroads for extra equipment, etc.

This naturally raises the question "Where and by whom should coal be stored?" The obvious answer is "As near as possible and practicable to the point of actual consumption, so as to insure the user a steady supply, to avoid the extra cost and extra breakage incident to each rehandling, and also so as to best utilize transportation facilities." In connection with steel plants, the point of storage is nearly always near the coke oven plant or power plants, as there is usually ample storage space available; but it has been suggested by some that even in the case of large steel companies in the same district a central coal storage ground might be established to supply several plants. This, however, does not seem to be a practicable suggestion.

In the congested city districts, the needed space for storage is too valuable for renting purposes and many of the large users of coal provide a storage supply on the outskirts of the city, or even outside the city limits, but within the range of suburban railroad service or even in motor truck hauling distance. One example of this is the Commonwealth Edison Co. already referred to, which in addition to the storage plants at each of its power houses within the city limits, keeps a supply of several hundred thousand tons just outside the city limits. Some of this coal has been in storage for at least 10 years and it is

Requirements of Ideal Storage Plant

TO store coal properly, the plant should possess certain requirements. These may be listed briefly as follows:

1. *Adequate ground area, so that several sizes and varieties of coal may be stored separately. Separation into sizes has not been considered so important for bituminous as for anthracite coal, but it is becoming more important because of the increasing attention being given to preparation of coal for domestic use, and because of the fact that danger of spontaneous combustion is decreased by keeping different sizes separate in storage.*
2. *Adequate facilities for rapidly and economically transferring coal from cars or from boats into storage.*
3. *Adequate facilities for rapidly and economically reclaiming the coal and for rapidly moving any part of the pile which shows evidences of taking fire.*
4. *Adequate track facilities, with gravity facilities, if possible, for handling cars.*
5. *Means for preventing undue breakage in handling.*
6. *Facilities for rescreening the stored coal to be used for domestic purposes, which, of course, increase the cost.*
7. *Adequate available water supply for putting out fires.*
8. *Low cost of installation, maintenance, and operation per ton of capacity. A storage plant is in operation irregularly and costs are likely to be correspondingly higher because of the heavy fixed charges, especially interest and depreciation.*

kept mostly for emergency purposes and not drawn on for current use.

The coal mine operator is interested in storage as an operating proposition that will enable him to run his mine more days per week and per year than he is able to do under present conditions. The car supply at the mine during the early part is usually better than during the latter part of the week and by placing coal in storage, he can take advantage of any extra cars that may thus be on hand. The demand for the different sizes of coal varies with the seasons and by having a storage pile he is able to supply this demand to better advantage. With storage facilities he can also fill out a day even though the car supply may be short at the beginning or end of a day.

Changes in Stored Coal

The physical disadvantages of storage are due to breakage of coal from extra handling and from weathering on the outside of the pile. The relative amount of the coal affected by outside weathering, of course, depends on the size of the pile as the disintegration due to weathering does not extend any distance within the pile. This breakage is not material in coal to be used for coke making or for stokers, but may cause a material loss in domestic coal due to the lower price obtained for the smaller sizes.

Under the head of chemical changes are loss in heating power or the B.t.u. value, changes in the coking properties and by-products, and actual losses in coal through burning as a result of spontaneous combustion. A clear distinction should be made between heating in a coal pile and spontaneous combustion or actual ignition of the coal. Unfortunately, this distinction usually is not made in discussing the chemical effects upon coal in storage, and there is a fertile field for investigation as to the effects produced in coal by different degrees of heating in the pile below the point of actual spontaneous combustion or ignition. The term "spontaneous combustion" is used too often to apply to heating to a low temperature below the ignition point.

A wide difference of opinion exists in regard to the decrease in heating value of stored coal and some of this undoubtedly is due to the failure to discriminate between a slight heating and actual combustion. There is a great prejudice on the part of many firemen against stored coal, much of which is not warranted. Experiments have shown that the heating value as expressed in B.t.u. is decreased little by storage but it is true possibly that stored coal burns less freely than fresh coal. Exact data upon this point are not available although experiments to determine what losses there are, if any, are in progress at the University of Illinois and probably elsewhere. In coal stored under water, the deterioration is negligible. Undoubtedly some of the prejudice against stored coal is justifiable and is due to the fact that in picking up coal from the storage pile with a clam shell bucket, dirt and rubbish are mixed with the coal, and it is not at all uncommon to have the report that more coal has been taken out of storage than was put into the storage pile. Naturally this increase is not of advantage to the fireman.

While some kinds of coal are more liable to heating and spontaneous combustion than others, it is not possible to say whether a certain coal will or will not heat or ignite spontaneously provided the conditions are favorable for spontaneous combustion. The evidence shows conclusively that all varieties of bituminous coal have been kept without firing and it is equally true that all varieties have fired under certain conditions. This does not mean that all coals are equally free from spontaneous combustion, as undoubtedly there is a difference in the storage quality of coals from different districts, but the evidence shows conclusively that it is not so much the kind of coal or the district that it comes from, as it is the size of the coal and the way in which it is handled. If investigation shows that coal from a certain district, or even from a given mine has fired frequently, common sense suggests not placing such coal in storage if it can be avoided. This has been recognized by the United States navy which has a list of accepted mines from which coal may be purchased. Many believe that there are inherent qualities in certain coals that render them particularly liable to spontaneous combustion, but the evidence available at this time does not permit the coal to be chosen for storage purposes on the basis of composition only.

(To Be Concluded)

Weathering Tests On Coal Extending A Year

Kind of coal	Loss of ammonium sulphate per net ton of coal, per cent	Loss of net B.t.u. per cubic foot of gas, per cent	Increase of coke yield, per cent	Increase of hydrogen in gas, per cent	Decrease of methane in gas, per cent
Pocahontas	15.12	2.17	0.36	2.85	2.80
Gates	3.81	2.40	0.96	5.18	6.03
Elkhorn	2.35	4.05	1.98	5.72	5.51
Sygan	9.77	1.72	0.42	5.89	3.24

A MODERN TYPE OF COAL HANDLING EQUIPMENT. NOTE THAT THE STORAGE AREA IS PAVED

Foundry Show

Will Be Held in Cleveland—Name Important A. F. A. Committees

Contrary to the plan of previous years, the next exhibition to be held in connection with the annual meeting of the American Foundrymen's association will be opened on Saturday instead of on Monday as heretofore. According to an announcement just made by C. E. Hoyt, secretary of the association, the annual meeting will be held in Cleveland Public Hall from April 28 to May 3. Saturday, April 28, will be known as "Cleveland Day" and will mark the opening of the exhibition. The opening session of the convention will be held Monday. The selection of Cleveland as the convention city by the convention committee was approved by the directors of the association Oct. 23.

At a meeting of the board of directors held in Chicago early in October reports of the secretary-treasurer, manager of exhibits, and of standing and special committees, were received. The retiring president, W. R. Bean of the Eastern Malleable Iron Co., Naugatuck, Conn., was elected to honorary membership. At the first meeting ofthe new board of directors at which C. R. Messinger, Sivyer Steel Casting Co., Milwaukee, presided, C. E. Hoyt was re-elected secretary-treasurer and R. E. Kennedy, University of Illinois, was named assistant secretary. R. A. Bull, S. T. Johnson, L. W. Olson and Fred Erb, together with the president, vice president and secretary will constitute the executive committee of the board for the coming year. Mr. Hoyt also was elected manager of the department of exhibits, which position he has held for a number of years.

A permanent board of awards, consisting of the seven last living past-presidents of the American Foundrymen's association, with the junior past president as chairman, was authorized to administer the awards resulting from the income on funds entrusted to the association for the advancement of foundry practice.

An invitation from the Association Technique de Fonderie of France to participate in an international convention and exhibit at Paris in September, 1923, was accepted and referred to a committee apponited by the president as follows: H. Cole Estep, European manager, Iron Trade Review, London, chairman; Stanley G. Flagg Jr., Stanley G. Flagg & Co., Philadelphia, vice chairman; L. L. Anthes, Anthes Foundry Ltd., Toronto, Canada; G. H. Clamer, Ajax Metal Co., Philadelphia; A. O. Backert, Penton Publishing Co., Cleveland; and Franklin G. Smith, Osborn Mfg. Co., Cleveland. This committee will represent the American Foundrymen's association and will determine to what extent the association may take an active part in the proposed international convention. Stanley G. Flagg, III of Stanley G. Flagg & Co., Philadelphia was elected a director to fill the vacancy caused by the death of John P. Pero.

Late News of the Societies

Notes on Past and Coming Meetings of National and Local Trade and Technical Organizations

THE annual meeting of the American Society of Mechanical Engineers will be held in the Engineering Societies building, New York, Dec. 4 to 7, according to an announcement just made. At that time John L. Harrington, of Kansas City, will succeed Dean Dexter S. Kimball of Cornell university as president of the society. Joint sessions will be held with the American Economic association, the American Society of Safety Engineers, the American Society of Refrigerating Engineers and the American Engineering Standards committee.

* * *

Harbors Congress to Meet

Announcement has been made that the eighteenth convention of the National Rivers and Harbors congress will be held at the New Willard hotel, Washington, D. C., Wednesday and Thursday, Dec. 6-7.

* * *

Announce A. I. E. E. Meetings

Following the policy adopted a year ago, the American Institute of Electrical Engineers will hold four general meetings during the year under the auspices of the various sections. The meetings scheduled for 1923 are as follows: Midwinter convention, New York, Feb. 14-16; spring convention, Pittsburgh in April; annual convention, Swampscoott, Mass., June 25-29; Pacific coast convention, San Francisco in September.

* * *

Personnel Association To Meet

Industrialists, educators, and personnel experts representing the country's largest business and manufacturing enterprises will attend the first annual convention of the National Personnel association which opens in Pittsburgh on Nov. 8. This association has taken over the activities of the National Association of Corporation Training and the Industrial Relations Association of America. Immigration, psychological tests, moving pictures, pension plans for workers, employment and labor turnover, shop training and the relation of industry to the engineering schools are topics that will be discussed at the convention. Among the speakers will be Michael Pupin, professor of electro-mechanics at Columbia university; Magnus W. Alexander, managing director of the National Industrial Conference board; George F. Quimby, industrial service secretary of the Associate Industries of Massachusetts; C. S. Ching, supervisor of industrial relations, United States Rubber Co.; Dean R. L. Sackett, Pennsylvania State college; C. R. Dooley, manager of personnel and training, Standard Oil Co. of New Jersey. Speakers at the session on health education will inculde Dr. R. S. Quimby, service manager of the Hood Rubber Co.; Dr. E. S. MacSweeney, medical director of the New York Telpehone Co.; Dr. F. L. Rector, National Industrial Conference board, and Paul E. Wakefield, Duquesne works, Carnegie Steel Co.

Convention Calendar

Nov. 8-10—National Personnel association, annual Convention, Pittsburgh.

Nov. 22-23—National Founders' association, fall meeting at the Astor hotel, New York. J. M. Taylor, 29 South La Salle street, Chicago, is secretary.

Dec. 4-8—American Society of Mechanical Engineers. Annual meeting in Engineering Societies building, New York. Calvin W. Rice, 29 West Thirty-ninth street, New York, is secretary.

Dec. 7-13—The National Exposition of Power and Mechanical Engineering at the Grand Central Palace, New York.

Jan. 11-12—American Engineering Council. Annual meeting headquarters F. A. E. S., 24 Jackson place, Washington. L. W. Wallace, 24 Jackson place, Washington, is secretary.

Feb. 19-21—American Institute of Mining and Metallurgical Engineers. Annual meeting in Engineering Societies building, New York. F. F. Sharpless, 29 West Thirty-ninth street, New York, is secretary.

April 30-May 3—American Foundrymen's association. Annual convention and exhibition at Public Hall, Cleveland. C. E. Hoyt, 140 South Dearborn street, Chicago, is secretary.

Builds New Plant To Centralize Nickel Rolling Operations

Fig. 1—View from airplane of the new refining and rolling mills of the International Nickel Co. at Huntington, W. Va.

UNTIL recently, monel metal was rolled almost exclusively in mills designed for steel and by crews trained primarily in steel rolling practice. The matte was shipped from the smelters in Canada to the refinery of the International Nickel Co. at Bayonne, N. J., where it was refined and cast in pigs or small ingots. These were shipped to the various rolling mills.

Although the rolling of steel and monel metal or nickel involves similar operations, the heating of the metal differs radically. For this reason an organization trained in handling and rolling steel naturally is at a disadvantage when confronted with the problems of rolling monel metal.

In order to provide facilities so that the rolling of the metal could be under the direct supervision and control of the International Nickel Co., its officers decided to build a complete refinery and rolling mill. In choosing a site, the factors of labor supply, convenience of shipping, power supply and proximity to natural gas were considered. Huntington, W. Va., a progressive community of 65,000 population, located on the Ohio river and on the main lines of the Chesapeake & Ohio and Baltimore & Ohio railroads, was selected. Electric power is supplied by the Virginia Power Co. over high tension transmission lines from a station about 60 miles distant. Since Huntington is in the Pittsburgh-Wheeling steel manufacturing district, an ample labor supply is assured.

The site, consisting of 80 acres about 3½ miles south of the center of Huntington and directly adjoining the Chesapeake & Ohio main line tracks on the north and the Guyan river on the south, was acquired about two years ago. In slightly more than 18 months from the day ground was broken a complete refining plant and rolling mill had been built and equipped, the buildings occupying approximately 40 acres.

Ore Smelted in Canada

When taken from the mines in Canada, the ore is subjected to a preliminary refining process which reduces it to the form of matte. This matte is received at the Huntington refinery and is elevated to a special type ball mill which grinds it to the consistency of sand and delivers it to a large hopper.

From this hopper it is sent to the calcining furnaces, a series of which occupy most of the floor space of one of the large unit buildings, known as the matte grinding and calcining furnace department. These furnaces are heated by natural gas, so that in this as well as in the numerous subsequent heating processes, there is no possibility of impurities entering the metal from the fuel. After passing through the calcining furnaces, the metal goes to the reverberatory furnaces and from them cast as pigs. The waste heat from the latter battery of furnaces is utilized to fire large boilers which will supply the ordinary steam requirements of the four large hammers. As a standby for the latter, natural gas fired boilers are installed in the hammer shop.

From the reverberatory furnaces the metal in the form of pigs goes to the electric furnaces where it is remelted and cast in the form of 2-ton ingots. The equipment in this department consists of one 3-ton Moore-type electric furnace and one 7-ton Heroult-type electric furnace, so that its present capacity is in excess of that of the remaining departments as at present equipped, while provision has also been made for the installation of further electric furnace units as required. So far as refining in electric furnaces and ingot castings are concerned, the handling of monel metal in this department does not differ materially from the usual steel mill practice.

In the next step in its reduction to

Comparing Nickel and Steel Practice

WHEN studying the accompanying description of the new rolling mills of the International Nickel Co., the reader doubtless will notice that the equipment is almost identical with that employed for rolling steel. As a matter of fact, the actual rolling operations do not differ in any important detail, but the heating of nickel or monel metal preparatory to rolling and the handling of the ingots involve certain steps not necessary in the case of steel.

This article, which describes the largest nickel rolling mill in the United States, was prepared by the staff of "Inco," a quarterly magazine published by the International Nickel Co., and will appear in the current issue of that publication.

Fig. 2 (Above)—Front view of the annealing furnaces in the new sheet mill at Huntington

Fig. 3 (Left)—Rear view of Stevens-type heating furnaces serving the merchant mill

commercial form, a number of operations are involved that are entirely lacking in steel processing. In the case of steel, the ingot goes directly to the soaking pit, the time required for this part of the process is short and involves little additional expense as compared with the time and processes through which the monel metal ingots must go after leaving the ingot mold and before they can be delivered to the rolling mill. Steel is a metal very susceptible to oxidation and surface defects on the ingots are automatically removed by the heating and rolling processes in which the oxidation scales off, leaving clean metal. On the other hand, monel metal is highly resistant to oxidation so that it is necessary to remove the outer skin of the ingot completely with its accompanying surface defects before proceeding to the operations of heating and rolling.

Ingots Are Milled

In the course of manufacture up to this point, certain defects, or oxides, are allowed to remain in the ingot. These oxides do not combine chemically with the metal but appear on or close to the surface of the ingot as physical defects. These defects, however, must be removed before the metal can undergo any further processes

Therefore the ingots are taken to milling machines where a heavy cut is taken off each side. As an extra precaution to insure satisfactory quality the milled ingots are examined and any defects remaining are chipped out with pneumatic hammers.

After the chipping process, the ingots go back to another battery of furnaces in the hammer department, where they are cogged down to bloom size. The steam hammers employed in this department range in capacity from 8 tons down to 1500 pounds. This equipment permits the making of special forgings of monel metal or nickel, in addition to the usual production of monel metal blooms for the rolling mill.

After being heated in the battery of furnaces in the rolling mill department itself, these billets go to the 24-inch merchant mill for conversion into sheet bars, or to the rod mill. The actual handling of monel metal in the merchant or the rod mill, or in its subsequent reduction in the sheet mills in another unit, is similar to the handling of steel. With a metal consisting chiefly of nickel and copper the greatest problems naturally are involved in the heating of it and this is equally true in every step of the process from the calcining furnace to the final annealing processes.

Some Features of the Sheet Mill

The bars from the merchant mill go to the sheet mill. In this department, as in all of the others, while equipment has already been installed with a capacity far in excess of the actual requirements, ample provision has also been allowed for expansion and the installation of additional units required. Grinding machinery has been installed to make it possible to deliver monel metal and nickel sheets ground to a good surface so that a wide range of articles may be produced from these sheets with the minimum amount of buffing being necessary in the finished form.

Electric unit drive is employed on every machine. The controls for the large rolling mill units are protected by special compartments, or houses, raised several feet above the floors or rolling mill itself. Numerous advances over current rolling mill practice have been incorporated in these control units, this being true in particular of one control of the rod mill in which the speed is allowed to vary from 450 to 1100 revolutions per minute.

Mills Are Motor Driven

The series of units comprising the rod mill is driven by a 400-horsepower alternating current motor and a smaller direct current motor, both of which work in conjunction with a highly specialized control system to give the great range of speed required. The necessary controls are installed in a small brick house.

With a natural alloy of distinctive

Fig. 4 (Below)—Interior of sheet mill building showing stands of rolls

Fig. 5 (Right)—The rolling equipment consists of a merchant mill, a rod mill and sheet rolling mills

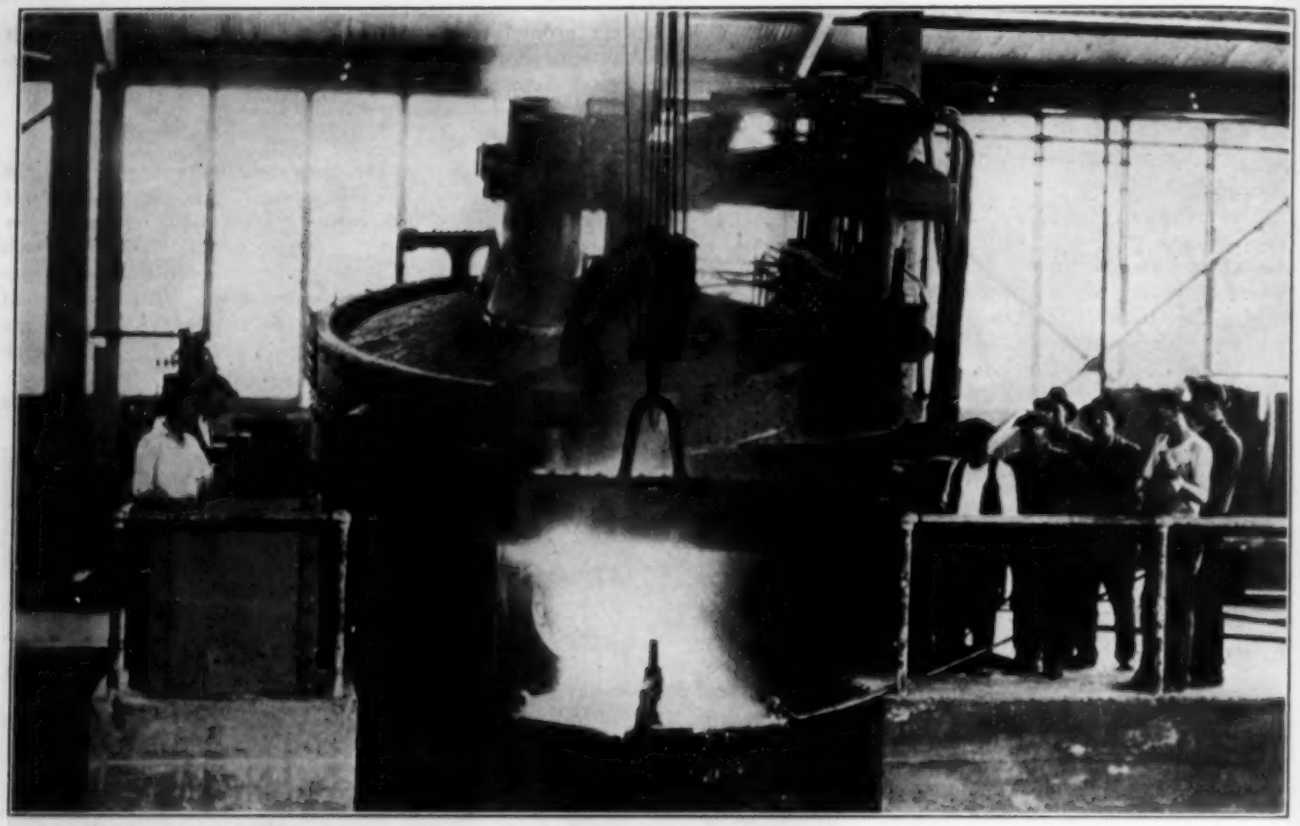


FIG. 6—TAPPING A HEAT FROM THE 7-TON, HEROULT TYPE, ELECTRIC FURNACE

physical properties as monel metal, it goes without saying that the most important units at the new mills are the laboratories. They are permanently housed in a building specially planned for this purpose and completely equipped for carrying out chemical and physical tests of every nature.

Monel metal and nickel will be produced at the new Huntington mills in the form of rods from 7/32-inch up to 12-inch round, square or hexagonal and in sheets from 0.018 to ¼-inch. These sheets will be rolled in all sizes commonly supplied in sheet steel. Special forgings in either monel metal or nickel also will be made.

The mills are in charge of A. S. Shoffstall, general manager, who is assisted by H. M. Brown.

Says Supply and Demand Must Prevail

(*Concluded from Page* 1889)

as volume is concerned. Who is blamable? The answer is: Any one who by word or deed has interrupted or hindered the operation of the natural law of supply and demand; or has interfered with the full, free and unlimited right to work, to operate and to produce.

All that is necessary to prosperity in the United States is the legitimate utilization of our stupendous resources. The fault for lack of continual prosperity in a measure may be laid at our own doors.

Just at this time it is generally recognized there is a shortage of labor, although now and generally there are considerable numbers of idle men who do not ask for or desire steady work. For various reasons many workmen have returned to their homes in foreign count ies. Business here was dull, and besides, these men on account of very large wage rates had accumulated money and believed themselves to be independent. The shortage in labor, however, has come principally as the result of the percentage immigration laws which have limited the number of workmen who would now come to this country if not prevented by the laws referred to. After some experience these laws are now believed by large numbers to be unreasonable. Ostensibly, at least, they were aimed at the sudden and large increases in the foreigners who were locating here, many of them entertaining views hostile to the ideas of our government. These laws ought to be promptly changed. The restrictions upon immigration should be directed to the question of quality rather than numbers of foreigners coming to this country. Measures for limiting the numbers of immigrants to those who are clearly shown to be healthy, morally, politically and physically, ought to be clear, strict and enforceable; but the number allowed to come here should be equal to the necessities of our industries. The administration of the law could be under the control of a competent and impartial governmental commission or department, to be managed for the benefit of the general public and not for the protection of any special class or the exploitation of any impractical or injurious theory.

In spite of the difficulties which have confronted industry and appreciably frightened investors, the manufacturers of steel are now producing, on the average, about 75 per cent of their estimated capacity. This is more than double the total capacity 20 years ago. We are making a better quality of steel, are increasing diversification of shapes for additional uses; and in many ways we are extending capacity and effecting economies, although selling prices have not kept pace with larger costs. We shall soon get back to a basis of business that will yield fair profits, if permitted to proceed without unreasonable interference.

As to general business conditions, in addition to what has already been said, great significance should be given to the publications concerning the enormous savings bank balances. These show conclusively a disposition to economize, whatever may be the reasons.

In this greatest, richest, most admirable country there should be the continuance of prosperity without prolonged depressions. The iron and steel industry can be a decided influence toward progress and stabilization.

Bethlehem Steel Earnings Show Increase

Net earnings of the Bethlehem Steel Corp., in the third quarter were substantially greater than in the two preceding quarters, though insufficient to cover dividend charges, according to a statement by President E. G. Grace of the company. Owing to the marked improvement in earnings for the third quarter and the continued increasing volume of business, together with the strong cash position of the company and the surplus earnings of other years, the directors declared the usual dividends.

In addition dividends of 1¾ per cent for the current quarter were also declared upon the new 7 per cent cumulative preferred stock, issued for the purchase of the Lackawanna Steel Co., or in exchange for the 7 per cent non-cumulative preferred stock, on which dividends had been declared in January 1922.

The company is operating at the best rate of the year, according to President Grace, and railroad service is improving. He mentioned the growing labor shortage as a serious matter for the steel industry, attributing this largely to present immigration laws. Mr. Grace urged modification of the present immigration restrictions.

Reorganization of the Lackawanna company has been completed and it is now being operated in every respect as a part of Bethlehem. Work already has begun on the modernization and rounding out of the Lackawanna property.

Stock of the Lackawanna Steel Co. was exchanged formally on Oct. 30 for the stock of the Bethlehem Steel Corp. under the terms whereby the latter took over the former company. In a letter to stockholders, Fred F. Graham, secretary of the Lackawanna Steel Co., points out that the consideration received by the Lackawanna Steel Co. for the sale of its properties to Bethlehem Steel Corp. consists of $12,500,000 par value 7 per cent cumulative preferred stock, $22,608,500 par value, Class B, common stock and $473,509 in cash.

The cash item includes $164,829, representing the amount equivalent to dividends from Sept. 1. 1922, to Oct. 1, 1922, which would have accrued upon the stocks above mentioned if they had been issued. Said stocks will be entitled to dividends from Oct. 1, 1922.

Under the above terms it is pointed out that the holder of 100 shares of Lackawanna Steel Co., capital stock having a par value of $10,000 will receive $3,560.39 par value of 7 per cent cumulative preferred stock and scrip of the Bethlehem Steel Corp. and $6,439.61 par value of the class B common stock of that company, making a total of $10,000 par value of the Bethlehem stock and in addition $134.87 in cash.

The letter further states that each Lackawanna stockholder will on distribution of Bethlehem stock receive two scrip certificates—one in respect of the preferred stock and one in respect of the class B common stock—each certificate representing a fractional right to receive one share of stock of the particular class when presented with other like certificates in integral amounts.

Columbia Steel Co. Is To Be Reorganized

A group of investors soon will acquire control of the Columbia Steel Co., Elyria, O. There will be no change in the name of the company, but a new Ohio corporation will be formed with a capitalization of $750,000, 7 per cent bonds; $750, 7 per cent preferred stock; and 30,000 shares of common stock of no par value. C. E. Lozier, vice president and general manager of the present corporation will be chairman of the board of directors of the new organization. Officers will consist of President H. M. Naugle, formerly first vice president and general manager of the National Pressed Steel Co., Massillon, O., subsidiary of the Central Steel Co.; secretary and treasurer K. R. Jenson, formerly secretary and treasurer of the National Pressed Steel Co.; vice president in charge of operations A. J. Townsend, formerly third vice president and works manager of the National Pressed Steel Co.

Machine Firms Merged

Stockholders of the Reed-Prentice Co., Worcester, Mass., have voted to approve the plan to purchase the business and part of the property of the Becker Milling Machine Co., Hyde Park, Mass., and the Whitcomb-Blaisdell Machine Tool Co., Worcester, both of which will be consolidated and operated in the plants of the former company. The property not taken over will be sold and the affairs of both corporations will be terminated.

Company in Bankruptcy

The National Sales Machine Co., Worcester, Mass., a $1,000,000 corp., has been petitioned in bankruptcy by its subsidiary, the Hobbs Mfg. Co., builder of machinery in that city, which has a claim for $169,489 for labor, materials and money furnished. The company was organized to build vending machines and coin detectors and subsequently took over the Hobbs Mfg. Co., but this feature of the business was never fully developed.

Minnesota Rate Upheld

Washington, Oct. 31.—Freight charges for transportation of coal and limestone, in carloads, from Missabe Junction to Steelton, Minn., during the period of federal control were found not unjust or unreasonable by the interstate commerce commission today and the complaint of the Minnesota Steel Co. against the director general of railroads was ordered dismissed. The Duluth, Missabe & Northern, also a subsidiary of the Steel corporation, was a co-defendant with the director general. The steel company asked reparation in the sum of $85,434, which is denied.

Japan Jobbing Stocks Off

Washington, Oct. 31.—Commercial Attache Abbott at Tokyo has cabled the department of commerce the value of warehouse stocks of iron and steel in Japan at the close of September was 26,030,000 yen, compared with 26,270,000 yen at the end of August. On Sept. 21 stocks of pig iron in warehouses in Japan totaled 188,000 tons. The inactivity of business in Japan is reflected in lessened credit demand and a consequent easing of the money market, Mr. Abbott has reported.

Gulf States Net Gains

Net operating income of $340,287 for the three months ended Sept. 30 is reported by the Gulf States Steel Co. After deductions for taxes, depreciation, etc., net income was $252,284. This compares with $225,664 in the preceding quarter and $80,316 in the first quarter of the year.

Will Blow In Furnace

The furnace of the Pulaski Iron Co., Pulaski, Va., which has been idle more than two years is to be blown in on foundry iron early in November. The past two years have marked the first time in the 32 years history of this stack when it has been out of blast for other reasons than making necessary repairs.

Enlarge Staff for Metals Tariff

Experts on Iron and Steel, Nonferrous Metals, Machinery, Heavy Hardware, Cutlery and Miscellaneous Likely To Be Engaged To Administer Flexible Provisions of New Act—Provisions Explained

WASHINGTON, Oct. 31.—Expansion of the metals division of the United States tariff commission is being planned as the result of the added duties imposed upon the commission by the flexible provisions of the Fordney-McCumber tariff act. It is probable that to the present staff, which is headed by Paul M. Tyler, will be added six experts to take charge of these proposed subdivisions: Iron and steel, nonferrous metals, machinery, heavy hardware, cutlery and miscellaneous.

Applications for reductions or increases in duties on metals under the provisions of the new tariff act will be scrutinized by Mr. Tyler. Consultation will be had with the chiefs of the respective subdivisions as occasion requires. The present commodity surveys conducted by the commission will be taken over by these new chiefs. In the selection of men to head these new sections more emphasis will be laid upon the economic side of the industry than upon the production or sales ends.

The Fordney-McCumber act permits the President, upon recommendation of the tariff commission, to increase or decrease tariff duties up to 50 per cent to equalize production costs. In some ways the flexibility lacks some of the latitude credited to it. Also, the difficulties of ascertaining production costs when there are several countries of origin abroad and many producers in the United States are not underestimated. It is stated, too, that the intent of the tariff act is to protect domestic industry, and wherever any doubt exists it naturally will accrue to the producer rather than the protesting consumer.

The theory in applying the flexible provisions of the new tariff act will be to place American products on a parity with foreign ones. For instance, if a protest is lodged against the present rates on magnesite the commission will make every effort to arrive at fair production costs for the domestic and the Austrian industry. A hypothetical case will be constructed for both the domestic and the foreign laid down in the principal consuming market, the vicinity of Pittsburgh. If the duty on magnesite is greater than the difference in production cost the commission probably would reduce the duty. The exact construction of the act still is somewhat hazy, owing to the numerous angles, but the probability is that the effort will be made to place American and foreign products on an equality in their principal markets, with any question of doubt decided in favor of the domestic producer because of the obvious intent of congress, in passing the tariff act, to protect the producer.

On the subject of ascertainment of production cost, which seems to present many obstacles, William S. Culbertson, vice chairman of the commission, says:

"The criticism is occasionally heard that costs of production can not be found and that if they could be, they would not form a sound basis for tariff making. Such criticisms result from ignorance or from a design to defeat scientific tariff methods. It is true that costs of production are often difficult to find, but every business man knows that the finding of them is the basis of successful business. Costs are no more uncertain nor do they vary more than industrial life as a whole. Variety and difference are inherent in the problem. Cost accounting is an attempt to measure scientifically the uncertainty and change in industrial life. To reject it would be to abandon the most effective means of measuring actual and potential competition. Considering the purpose for which congress has laid down the rule, the term 'cost of production' will undoubtedly be broadly construed. In determining these costs we shall take into consideration all conditions of production including wages and other cost items, wholesale selling prices, and advantages and disadvantages in competition. This method will disclose, as no other can, the competitive strength of industries in the United States and competing foreign countries, and will thus provide a sufficiently accurate basis for tariff making."

In the reorganization of the tariff commission four broad divisions have been set up, the office of chief investigator, the office of chief economist, the legal division and the secretary. A complaint concerning the metals schedule, for example, will be referred to the head of the metals division for consideration. He will, after deliberation, go into conference with the chief economist, the chief investigator and the head of the legal division, and this advisory board of four will decide whether the protest is worthy of action. In explaining the new rules of procedure promulgated by the commission Mr. Culbertson has said:

"Anyone can apply for an investigation. The application need not be in any special form, but it must be in writing and signed by or on behalf of the applicant. It must also recite the relief sought and the reasons therefor. Obviously, the mere filing of an application does not obligate us to proceed formally. We shall not order an investigation unless the application or a preliminary investigation discloses to our satisfaction that there are good and sufficient reasons for doing so under the law.

"We can order a formal investigation upon our own initiative as well as upon application and we are not confined to the issues presented in an application; we may broaden, narrow, or modify the issues to be determined.

"When we finally decide to proceed formally with an investigation, we shall issue and publish a notice of its nature and scope. Any person who then can show to our satisfaction an interest in the subject matter of the investigation may enter his appearance in person or by a representative. He will be notified of public hearings and afforded opportunity to offer such testimony as we may deem necessary for a full presentation of the facts. Our hearings will usually be open to the public. Evidence submitted will be subject to verification from the books and records of the parties in interest. In conjunction with hearings we shall conduct field investigations both in the United States and in foreign countries.

"In the case of formal investigations our procedure will be judicial in character. Our rules provide for the attendance and examination of witnesses, the production of documentary evidence, the issuance of subpoenas, and the taking of depositions. The commissioner or investigator in charge of any investigation will summarize the hearings and the information obtained by field investigation and will prepare a report. Parties of record will be permitted, before they file their briefs, to examine this report, as well as the record, except such portions as relate to trade secrets and processes.

"Final hearings will, of course, be before the commission. Parties of record may file briefs and in some cases present oral arguments. Our findings will be in writing, and will be transmitted with the record to the President for his action."

Neal Brewster has been appointed receiver of Heckerman & Hayward, Inc., Syracuse, N. Y. The company manufactures ornamental iron. Its liabilities are estimated at $20,000 and assets at $16,000.

Men of the Iron Trade

Personal News of a Business Character Regarding the Men of Affairs of the Industry

DAVID T. BUFFINGTON, for 20 years in the sales department of the Illinois Steel Co., Chicago, recently was made manager of sales for the Chicago district for the company and special sales agent in the Chicago district for the Carnegie Steel Co., succeeding J. G. Caruthers, resigned. Mr. Buffington was born in Covington, Ky., and his first business experience was in a clerical capacity for the American Wire Nail Co., which later was merged with the American Steel & Wire Co. During the two decades he has been with the Illinois Steel Co. he has sold various classes of products and recently has been in charge of sales to railroads and car builders. He has a wide acquaintance among steels users, especially the Chicago district.

T. H. Newton, Easthampton, Mass., has taken the position of superintendent of the Defiance Button Machine Co., Long Island City, N. Y.

F. J. Hammes has been made production manager for the D. J. Ryan Foundry Co., Ecorse, Mich., succeeding the late J. F. Flynn.

Jean Carles, L'Ingenieur Delegue of the Association Technique de Fonderie de France has resigned to become manager of a foundry at Amiens.

A. P. Allen has resigned as manager of sales and repairs of the Federal Shipbuilding Co., 26 Beaver street, New York. A. C. Rohn is acting manager of sales and repairs.

H. J. Hair, who has been identified with Manning, Maxwell, Moore, Inc., New York, for about 12 years, latterly as manager of the Pittsburgh district sales office, in the Park building, has resigned effective Nov. 1.

William Sanger, treasurer of the Boston Pressed Metal Co., Worcester, Mass., will sail from San Francisco, Nov. 16, for a six months trip to South America. He plans to attend the Brazilian centennial exposition in Rio Janeiro.

Jens Bertelsen, Paul J. Bertelsen and Ralph C. Christensen have become associated with the Atlantic Works, Boston, engine builder, as vice president, works manager and outside superintendent, respectively.

William H. Blount has resigned as superintendent of Sleeper & Hartley, Inc., Worcester, Mass., and has organized the Arey & Blount Electric Co., Worcester, to make electric lighting devices.

Maurice E. Sherman, purchasing agent of the T. A. Scott Co., has returned to the Babcock Printing Press

DAVID T. BUFFINGTON

Mfg. Co., New London, Conn., as manager of the service and transportation department which recently was established. Prior to 1918 Mr. Sherman had been with the company 17 years in charge of purchases and repairs.

Warren A. Ellsworth of the class of 1922, Worcester Polytechnic Institute, Worcester, Mass., has taken a position on the engineering staff of the Wheeling Mold & Foundry Co., Wheeling, W. Va.

W. Russell Baird has taken charge of the foundry of the Vaughn Foundry Corp., Norwich, Conn., succeeding A. A. MacDiarmid who has gone to Kenogami, Ont., with the Price Bros. Co., Ltd.

Arthur H. Hunter, president of the Atlas Steel Corp., has resigned his active connection with the corporation, effective Nov. 1. Mr. Hunter was avtive in the negotiation that resulted in the merger of the Atlas Crucible Steel Co., of which he was president, with the Electric Alloy Steel Co. He stated that now that the purchase was successfully effected, he felt at liberty to transfer his personal activity to another connection. He retains his stock interest in the Atlas corporation and will continue as a director and member of the executive committee.

J. Verner Critchley, president of the Walden-Worcester, Inc., Worcester, Mass., maker of wrenches, has entered the Coppus Engineering Co., that city, in an executive capacity as the representative of the creditors' committee.

Frederick D. Dimmick, Philadelphia pig iron sales agent for the Sloss-Sheffield Steel & Iron Co., Birmingham, has also been made sales agent for New York territory. His headquarters are at 501 Franklin Bank building, Philadelphia.

H. P. Hevenor has joined the staff of Dwight P. Robinson & Co., Inc., New York, as consulting engineer. He was until recently a member of the firm of Engel & Hevenor, Inc., where he specialized in track construction, taking part in numerous large projects in the East, Middle West and South.

W. H. Phillippi has resigned as vice president and general manager of the Lackawanna Bridge Works Corp. which recently was purchased by the Bethlehem Steel Co. in the merger with the Lackawanna Steel Co. Mr. Phillippi has just completed the reorganization work in connection with the transfer.

M. Emanuel de Margerie of the University of Strasbourg, French exchange professor in applied science and engineering, has arrived in this country to take up his work for the academic year 1922-23 in seven leading technical schools, succeeding Prof. Jacques Cavalier. Professor de Margerie has begun work at Columbia university. Other institutions at which he will appear are Harvard, Cornell, Johns Hopkins, Yale, Massachusetts Institute of Technology and the University of Pennsylvania. The American exchange professor under this arrangement is Dean John Frazer of the University of Pennsylvania, who has already begun his task in France.

Brazil Buys Rails

(*Concluded from Page* 1184)

satisfactory, notwithstanding Lorraine and Luxemburg competition.

The semifinished steel market is firm. Demand for merchant bars is strong. Transactions in plates and sheets are closing down.

The following prices have been registered: Merchant bars, 435 francs ($30.45) per metric ton, for domestic use and 430 francs ($30.10) f.o.b. Antwerp for export; beams, 400 francs ($28) to 415 francs ($29.05), and 385 francs ($27.15) to 390 francs ($27.30) for export; plates 5 millimeters and over, 440 francs ($30.80) to 450 francs ($31.50) f.o.b. Antwerp; 3-millimeter sheets, 500 francs ($35); wire nails, 500 francs ($35).

Pay Premiums for German Materials

European Special Service

DUSSELDORF, Germany, Oct. 19. —The position of the mark is so unstable that for the present quotations expressed in German currency possess little value. Therefore prices must be considered purely nominal unless given in sterling or dollars. The exchange situation overshadows everything else in German business.

Mark—$0.0004

Prices expressed in marks have again advanced. No. 3 foundry pig iron is nominally held at 32,626 marks ($13) per metric ton, with hematite, equivalent to the American bessemer grade, 38,099 marks ($15.60). Billets are now quoted 39,980 marks ($16) per ton, with bars, plates and shapes ranging from 48,990 to 55,695 marks ($20 to $22.20). Thin sheets are 74,260 marks ($29.60) per ton.

With the mills well filled it is practically impossible to place contracts at these prices which are those ruling, however, for mill delivery at the convenience of the producer. Merchants and others having tonnage available for resale are quoting fantastic premiums. Recently, for instance, standard rails on which the mill quotation is 54,500 marks ($21.80) have actually been sold at 96,000 marks ($38.40). Structural shapes have been sold recently in Dusseldorf at 127,000 marks ($50.80), this being equivalent to 2.30c per pound. This price is about the same as that prevailing in the United States.

Second-hand rails have been sold in the Dusseldorf market for 72,000 marks ($28.80), and heavy cast iron scrap suitable for cupola or blast furnace charging is now quoted 50,000 marks ($20) per metric ton. On account of the existing confusion, mills which are not provided with their own supply of raw materials are finding themselves in an unenviable position.

Relatively little business is passing. Everyone who can do so prefers to wait until a more definite survey of the monetary crisis can be made.

Melt of Ohio Foundries Shows a Loss

OPERATIONS of Ohio foundries during September showed a decline, according to the monthly trade report of the Ohio Foundrymen's association. The actual melt during the month was 62.7 per cent of the normal melt as compared with 72.2 per cent in August. In July the figure was 58 per cent.

A slight improvement was shown in the number of foundries reporting, 68 having returned statements as against 59 in August. One of the features of the report was the announcement that the association has established a new nonferrous section, sufficient foundries of this class having affiliated with the organization to give an index of that branch.

September was the first month during 1922 to show retrogression in the actual melt, operations having improved continuously from 20 per cent in January to a high point of 72.2 per cent reached in August.

The accompanying chart, prepared from monthly figures consolidated with statistics contained in the 1921 *Year Book*, shows the general trend of operation since January, 1921. Stocks on hand which started to fall off in July, declined still more sharply in September. After a sharp increase in August stock received in September fell by about the same amount.

The trade report for September may be summarized as follows:

		Tons	Per cent of normal melt
Normal melt	.....	21,761	100.0
Actual melt	.....	13,639.35	62.7
Pig iron received	.....	5,289.6	24.3
Spot	1,644.5	.....	....
Contract	3,645.1	.....	....
Scrap iron received	.....	2,088.785	9.6
No. 1 machinery	1,219.435	.....	....
No. 1 railroad	35	.....	....
Miscellaneous	834.35	.....	....
Pig iron on hand Oct. 1	.....	13,426.9	61.7
Scrap on hand Oct. 1	.....	3,253.548	14.9

The 68 foundries which reported operations have a normal melt of 21,761 tons and melted 13,639.35 tons, representing 62.7 per cent. Pig iron received during the month was 5289.6 tons of which 1,644.5 tons was purchased in the spot market and 3645.1 tons was bought on contract. Scrap iron received totaled 2,088,785 tons and included 1,219,435 tons of No. 1 machinery, 35 tons of No. 1 railroad and 834.35 tons of miscellaneous. Pig iron on hand on Oct. 1 was 13,426.9 tons and was 61.7 per cent of the normal melt. Scrap on hand Oct. 1, was 3,253,548 tons and represented 14.9 of the normal melt.

Due to the fact that beginning Jan. 1 the member foundries reported iron and scrap "received" and "on hand," instead of "iron only" as in 1921, the chart showing the amounts of these materials on hand and received are not continuous. The proportionately higher values, shown since January as "stock on hand" and "stock received," are due to the inclusion of scrap with pig iron.

Brass, bronze, aluminum and other nonferrous foundries operated at 65 per cent of normal, which was about the same as for ferrous foundries.

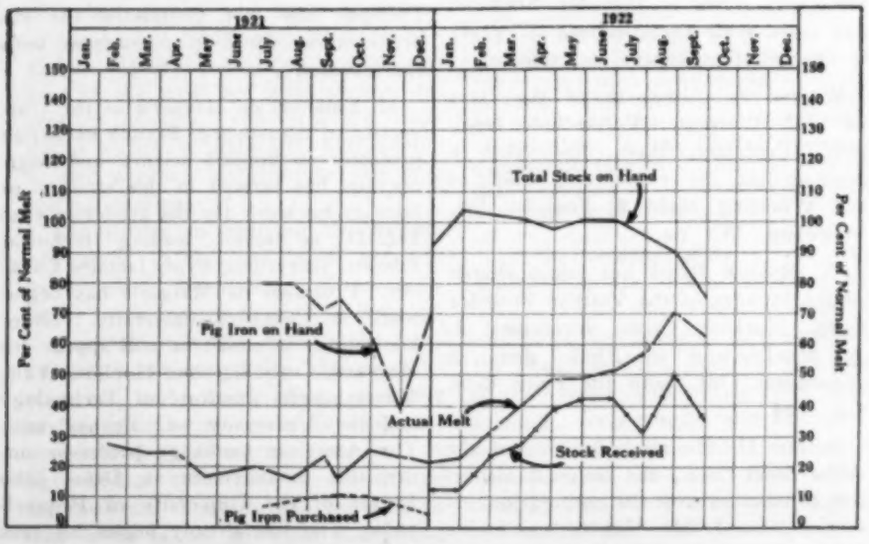


CHART SHOWING TREND OF MELT IN OHIO FOUNDRIES

Export Market

For Coke By-Products Tends Upward —Benzol, Naphtha Prices Hold

New York, Oct. 31.—While no large amount of buying is expected, the time is near when fertilizer manufacturers usually supplement their yearly contracts. Prices on sulphate of ammonia are slightly stronger. Sellers now are quoting domestic business at $3.05 to $3.10, works, as against the flat price of $3.05 a week or so ago. The export market continues to hold at $3.55 to $3.60, port, although the tendency is upward. Sellers look for buying by the Orient soon. Orders of sulphate of ammonia can now be handled for early shipment.

Sellers of light oil distillates are making no promises as to delivery, but nevertheless are fairly certain of being able to make shipments within three to four weeks. Prices continue unchanged as follows: Pure benzol, 30 cents ovens in tanks and 35 cents in drums; 90 per cent benzol, 27 cents in tanks and 33 cents in drums; toluol, 30 cents in tanks and 35 cents in drums; solvent naphtha, 27 cents in tanks and 32 cents in drums; commercial xylol, 29 cents in tanks and 34 cents in drums, and pure xylol, 30 cents in tanks and 35 cents in drums. No new prices have been established on naphthalene although this is expected at most any time, as the contracting season is near. Quotations continue virtually nominal. Phenol is being quoted at 20 cents to 22½ cents, works.

Coke Oven By-Products

		Spot
Per Gallon at Producers' Plants in Tank Lots		
Pure benzol	(nominal)	$0.30
Toluol	(nominal)	0 30
Solvent naphtha	(nominal)	0.27
Commermial xylol	(nominal)	0.29
Per Pound at Producers' Plants		
Phenol	$0.20 to $0.22½	
Naphthalene, flake		nominal
Naphthalene, balls		nominal
Per 100 Pounds at Producers' Plants		
Sulphate of ammonia	$3.05 to $3.10	
Contract		
Pure benzol		$0.30
Toluol		0.30
Solvent naphtha		0.27
Commercial xylol		0.29
Per Pound at Producers' Plants		
Phenol		nominal
Naphthalene, flake		nominal
Naphthalene, balls		nominal
Per 100 Pounds at Producers' Plants		
Sulphate of ammonia (12 months)	$3.05 to $3.10	

Shipbuilding Unchanged

Washington, Oct. 31.—Shipping under construction at the end of the third quarter totaled 150.623 tons, or precisely the same as at the end of the second quarter, according to the department of commerce. Shipping under construction the world over aggregated 2,702,556 tons at the close of the third quarter against 3,235,430 at the close of the second quarter. Of this decline of more than 500,000 tons of shipping construction in the third quarter, Great Britain accounted for slightly more than 300,000. Tonnage under construction in American yards in 1922 is only 35 per cent of the 1921 figure but is 14 per cent higher than the prewar average.

Census Report Gives Loss in 1921 Auto Industry

Washington, Oct. 31.—The cost of materials used in the automobile industry in 1921 totaled $1,104,497,189, a 30 per cent decrease from the $1,578,651,574 of 1919, the census bureau states.

The bureau's comparison of employes, wages and value of the products of the automobile industry for 1921 and 1919 is as follows:

	1921*	1919*
Number establishments	368	315
Persons engaged	164,999	242,922
Proprietors and firm members	35	36
Salaried employes	22,061	32,327
Wage earners (average number)	142,903	210,559
Salary and wage payments	$278,912,691	$379,381,674
Salaries	57,972,175	67,215,804
Wages	220,940,516	312,165,870
Contract work	986,193	198,142
Cost of materials	1,104,497,012	1,578,651,574
Value of products	1,666,140,189	2,387,903,287
Value added by manufacture†	561,643,177	809,251,713

*Figures for 1921 do not include establishments reporting products under $5000, thus excluding nine establishments which employed 13 wage earners, and in the aggregate reported products to the value of $34,819. The figures for 1919, however, include seven establishments of this class which employed six wage earners and reported products to the value of $24,652.

†Value of products less cost of material.

The bureau has classified as follows the hours of work of the wage earners of the automobile industry:

Prevailing hours per week	1921 Average number wage earners	1919 Average number wage earners
Total	142,903	210,559
44 and under	7,602	3,674
Between 44 and 48	4,160	2,957
48	67,414	94,880
Between 48 and 54	52,956	82,747
54	2,580	9,911
Between 54 and 60	3,995	15,807
60	4,196	583

Announces November Sales

Washington, Oct. 31.—War department sales of surplus material scheduled for next month include ordnance supplies at Toledo, O., on Nov. 13, ordnance supplies at Rock Island, Ill., on Nov. 17, ordnance supplies at Morgan N. J., on Nov. 21 and ordnance material at Rock Island on Nov. 23. The sale at Morgan will be by auction, the remainder by sealed bids.

Relining Orders

Overshadow Refractory Construction Needs—Chrome Brick Substituted

Pittsburgh, Oct. 31.—Some refractory manufacturers note a sustained demand while others report minor recessions. The latter have full order books for some time to come, numerous orders having been taken at the last price change.

Orders for fire clay and silica brick vary in size, the usual one calling for 60,000 to 150,000 brick at a time, with an occasional requirement involving 200,000 to 500,000 brick. Little or no new construction is noted although several blast furnace interests have complete relinings on order. Brickmakers still have transportation difficulties, recent railroad embargoes hindering shipments, and car shortages, too, retarding shipping activity for the present in many directions.

Brick kilns report a shortage of labor. Magnesite brick inquiries continue to come out from time to time and an occasional sale of 10,000 or 12,000 brick at a time is noted at the prevailing market price, $75 seaboard base. Grain magnesite, while higher in price by about $3 in some directions, the market is firm at $43.50, seaboard base. Recent chrome orders have brought $50 but due to scarcity of chrome ore higher prices by $5 shortly may be inaugurated. A single carload to a Canadian user is among the recent orders placed. Inquiries pending include one each involving 10,000, 12,000 and 25,000 brick, respectively.

One user from the Mahoning valley which ordered a carload of chrome brick for experimenting for substitution of chrome for magnesite brick, has demonstrated the successful outcome of the experiments by issuing shipping instructions on 25,000 additional chrome brick.

Refractories

FIRE CLAY BRICK	
(Per 1000 f.o.b. works)	
Pennsylvania, No. 1	$43.00 to 46.00
Pennsylvania, No. 2	38.00 to 43.00
Ohio, No. 1	41.00 to 43.00
Ohio, No. 2	39.00 to 41.00
Illinois, No. 1	43.00 to 46.00
Illinois, No. 2	40.00 to 42.00
Kentucky, No. 1	43.00 to 45.00
Kentucky, No. 2	39.00 to 41.00
Missouri, No. 1	48.00
Missouri, high grade	53.00
Maryland, No. 1	42.00 to 46.00
Maryland, No. 2	35.00 to 40.00
SILICA BRICK	
Pennsylvania	$45.00
Chicago	53.00
Birmingham	48.00
MAGNESITE BRICK	
(Per Net Ton Seaboard Base)	
9 x 4½ x 2½	$75.00
CHROME BRICK	
(Per Net Ton)	
9 x 4½ x 2½	$50.00

War Debt Policy

Through International Conference, Urged by Exporters

An international conference of business men to formulate a policy with regard to the interallied war debt was urged in a resolution by the American Manufacturers' Export association in thirteenth annual convention at the Waldorf-Astoria hotel, New York, Oct. 25-26. The conference, it was said, should be called at the invitation of the United States chamber of commerce. In another resolution, the association went on record as approving the policy of President Harding on the subject of the American merchant marine, and in still another, extended its appreciation to the bureau of foreign and domestic commerce.

Discussion centered principally on the tariff, ship subsidy and interallied debt, in their application to foreign trade. An interesting session was given over to a summary of trade conditions throughout the world, as presented by bureau of foreign and domestic commerce. Excepting a few localities, according to the bureau, business is improving steadily throughout the world.

While foreign trade made a decided gain in September and it is believed that this advantage will be maintained, war indebtedness abroad remains a depressing factor. However, Myron W. Robinson, president of the association, said he believes that business has attained a momentum that cannot be checked permanently. He opposed the cancellation of allied debts to this country.

Sir George Paish, British economist and editor, expressed the opinion that the United States in passing the recent tariff measure made a grave mistake, as it made it difficult for debtor nations to pay their debts to the United States in any medium of exchange other than gold. He also criticized the American government for placing gold in the treasury instead of allowing it to go to federal reserve banks where it would stimulate buying power.

Myron W. Robinson, of the Crex Carpet Co., was re-elected president of the association. W. H. Robinson, of the Heinz Co., and E. P. Thomas, president of the United States Steel Products Corp., were elected vice presidents. Philip T. Kennedy was re-elected treasurer. Two new directors also were elected, C. P. Coleman, president of the Worthington Pump & Machinery Co., and Charles S. Gawthrop, vice president of the American Car & Foundry Co.

More Coke Exported Now

Washington, Oct. 31.—Exports of coke from the United States in September totaled 35,472 tons valued at $448,061, compared with 17,634 tons valued at $149,352 in September, 1921, according to the department of commerce. In the nine months ended with September exports of coke amounted to 256,181 tons valued at $2,473,348, against 198,251 tons valued at $2,115,157 in the same months of 1921. September exports of bituminous coal were 1,175,007 tons and of anthracite, 88,688.

Puddlers' Wages Raised $1.12 Per Ton

Puddlers' wages for November and December in the mills represented by the Western Bar Iron association will be $10.05 per ton, an advance of $1.12 over wages in September and October. The bimonthly examination of bar prices at Youngstown, last week, developed the fact that the average for September and October was 1.95c, as compared with 1.70c in the preceding two months.

The puddling rate at the peak in January and February, 1921, was $18.76 per ton, while the general average for 1914 was $5.60. Following are average selling prices for the periods designated:

	1922	1921	1920	1919	1918
Jan.-Feb.	1.60c	2.80c	2.55c	3.10c	3.10c
Mar.-Apr.	1.50c	2.55c	2.70c	2.75c	3.30c
May-June	1.60c	2.30c	3.00c	2.50c	3.35c
July-Aug.	1.70c	1.85c	3.25c	2.50c	3.40c
Sept.-Oct.	1.95c	1.70c	3.40c	2.50c	3.45c
Nov.-Dec.	....	1.65c	3.55c	2.50c	3.45c
Yearly av'ge.		2.14c	3.08c	2.64c	3.34c

Wins Demurrage Objection

Washington, Oct. 31.—The interstate commerce commission has ruled in favor of the United States Steel Products Co. in its complaint against the director general of railroads involving demurrage and storage charges assessed at Seattle and Tacoma, Wash., between Feb. 24, 1918, and Sept. 9, 1919, on iron and steel articles from points east of the Mississippi river.

Obituaries

CHARLES Glover, 75 years old, president of the Skinner Chuck Co., New Britain, Conn., died at his home in that city, Oct. 25, after several years illness. For 19 years he was president of the Corbin Screw Corp., a subsidiary of the American Hardware Corp., resigning in March, 1921, on account of ill health. He was also president of the Corbin Motor Vehicle Corp., and a director of the American Hardware Corp., the North & Judd Mfg. Co., and the Aetna Nut Co., Southington, Conn.

James Francis Flynn, production manager of the D. J. Ryan Foundry Co., Ecorse, Mich., died suddenly Oct. 16.

John C. Norton, superintendent of the Clark-Aiken Co., Lee, Mass., builder of machinery, died at his home in that city, Oct. 24, aged 70 years. He had been connected with the business for 56 years.

Wilder B. Hodsdon, president and treasurer of the Hi-Lo Jack Corp., Boston, maker of automobile jacks, died in a Boston hospital, Oct. 28. He was 63 years old and lived in Cambridge, Mass.

Edward J. Hamant, for many years general superintendent of the Cincinnati Screw & Tap Mfg. Co., died recently at his home in Westwood, a Cincinnati suburb. Mr. Hamant was 63 years old and had been in failing health for more than a year.

John C. Kroner, aged 57 years, president of the Fred Kroner Hardware Co., LaCrosse, Wis., manufacturer and jobber of hardware, and head of the LaCrosse Steel Roofing & Corrugating Co., died suddenly at Atlantic City, N. J., on Oct. 18 while attending the convention of the National Hardware association.

Philip Henry Klein, president of the Dominion Lamp Co., Ltd., and officially associated with the General Incandescent Lamp Co. and the Electrical Directors' association, of New York, died at Westmount, Que., on Oct. 24, after a protracted illness. He was born in New York and was 64 years of age. He was for some years associated with Thomas A. Edison in electrical research.

Philip C. Walsh Jr., president of the Walsh's Sons & Co., Newark, N. J., iron and steel merchants, died Oct. 28 at his home in Newark. Mr. Walsh spent his life in the iron and steel business. He also was largely interested in other business corporations. At one time he was president of the Waste Trade Dealers' association. One of Mr. Walsh's sons is Philip C. Walsh, III, general manager of the National Steel Rolling Co., New York and Schuylkill Haven, Pa.

Steel Exports at 1922 Low Point

Outbound Products Decline Nearly 16,000 Tons in Month, Totaling Only 128,370 Tons in September—Structural Steel Shipments Drop Nearly 17,000 Tons—Other Products Gain and Lose, Balancing Totals

EXPORTS of iron and steel in September amount to only 128,370 tons, the low point of the year and the smallest tonnage exported in any month since November a year ago. Compared with September 1921 the month's total this year is a gain of 34,579 tons. Compared with August this year it is a loss of 15,894 tons.

September's loss from August is covered entirely by the month's shrinkage in structural steel. The three structural items in August gave a total of 24,916 tons. In September these totaled only 8159 tons. This is a difference of 16,757 tons. The structural tonnage in September was smaller by nearly 3000 tons than the shapes total a year ago.

The decline in structural steel was not, however, the only loss shown by individual products in the month. Scrap fell off approximately 1000 tons, semi-finished steel dropped 2500 tons and iron and steel bars declined more than 1000 tons. Other products which showed sizable losses were: Galvanized sheets, 4000 tons; plain wire, 1700 tons; and galvanized wire, 2000 tons.

Material gains over August were shown by several products in September. Pig iron increased 3500 tons, black steel sheets 3000 tons, tin plate 2300 tons, track fastenings 1300 tons, and wrought pipe 4000 tons.

Products in which the September export were about equal with those of August include plates; hoops, bands, scroll and strips; rail; cast pipe; wire products; nails and bolts, nuts and rivets.

IRON AND STEEL EXPORTS

Gross Tons

	September 1922	September 1921	Nine months ending September 1922	Nine months ending September 1921
Pig iron	5,203	2,889	22,767	20,801
Scrap	2,419	1,387	55,363	27,201
Semifinished steel*	6,815	1,318	83,187	8,091
Iron and steel bars†	16,374	4,269	186,425	173,696
Alloy steel bars	380		4,408	
Wire rods	1,401	660	36,514	11,694
Boiler plate	218		11,406	
Other plates	5,078	10,068	65,578	303,365
Galv. sheets	5,697	2,628	88,700	45,535
Black sheets, steel	9,231	16,550	197,892	101,189
Black sheets, iron	930	(a)	9,520	(a)
Cold rolled strips	757	1,013	3,998	15,793
Hoops, bands and scroll	1,746		20,960	
Tin and terne plate	6,357	4,724	59,902	84,673
Fabricated plates‡	331	770	2,439	8,707
Struct'l steel, plain	5,436		42,382	
Struct'l steel, fabricated	993	11,531	15,396	266,008
Other struct'l forms	1,730		17,302	
Rails, over 50 pounds	15,963	20,442	199,636	282,162
Rails, under 50 pounds	2,488		20,836	
R. R. spikes	710	212	5,882	6,964
Track fastenings and material	2,012	(a)	21,103	(a)
Boiler tubes	1,173		8,876	
Casing and oil line pipe	4,834		36,625	
Welded black pipe	6,147	8,382	57,810	307,602
Welded galv. pipe	3,023		24,102	
Malleable iron pipe fittings	562		6,075	
Cast iron pipe	1,354	2,148	13,180	42,892
Cast iron pipe fittings	864		6,338	
Plain wire	1,912		27,419	
Galv. wire	2,755	1,519	64,096	58,283
Barbed wire	6,880	1,193	54,327	22,539
Manufactures of wire	2,215	(a)	19,863	(a)
Cut nails	246	55	3,021	650
Wire nails	2,320	798	46,836	19,205
Other nails includ'g tacks	412	290	3,075	3,751
Bolts, nuts, rivets and washers	1,404	945	13,270	21,417
Total	128,370	93,791	1,556,509	1,832,218

*Include ingots, blooms, billets, slabs, sheet and tin plate, bars and skelp.
†Includes rods other than wire, and light structural forms.
‡Ship and tank plates punched and shaped.
(a) Formerly by value.

Reclassifies Imports To Meet Tariff Schedule

Import classifications resulting from the new tariff act have been compiled and issued by the bureau of foreign and domestic commerce. The schedule governing the statistical classification has been approved by Secretaries Mellon and Hoover as containing the details necessary to be shown on the consular invoices and entries for goods imported into the United States.

The reclassification affects practically the entire list of imports. In iron and steel the new schedules, by major classifications, will be as follows: Iron ore, pig iron, common bar iron, cold-rolled bar iron, galvanized bar iron, wire rods, iron and steel boiler plate, iron and steel sheets, galvanized sheets, ingots, blooms and billets, ingots, blooms and billets containing alloys, alloy steel sheets and plates, tin plate, structural steel, rails, tubular products, wire, wire products, cut nails, wire nails, bolts, nuts and rivets, castings and forgings, and numerous products made of iron and steel. The schedule also lists the various ores and ferroalloys: Manganese, ferromanganese, chromium, ferrochrome, ferrosilicon, tungsten, vanadium, titanium, and several others. The listings follow the tariff as published in IRON TRADE REVIEW Sept. 28, even to the itemizing of values upon which the incoming iron and steel will be dutied.

Beehive Coke Output 211,000 Tons a Week

Washington, Oct. 31.—Production of beehive coke in the United States in the week ended Oct. 31 amounted to 211,000 tons, compared with 185,000 tons in the preceding week. The outputs in the various districts with comparisons of daily averages, as compiled by the geological survey, follow:

	Week ended Oct. 21, 1922	Week ended Oct. 14, 1922	Week ended Oct. 22, 1921
Pennsylvania and Ohio	156,000	141,000	76,000
West Virginia	17,000	14,000	3,000
Alabama, Tennessee, and Georgia	16,000	9,000	10,000
Virginia and Kentucky	13,000	10,000	7,000
Colorado and New Mexico	5,000	6,000	2,000
Washington and Utah	4,000	5,000	4,000
United States total	211,000	185,000	102,000
Daily average	35,000	31,000	17,000

Preliminary returns on coal production in the fourth week of October indicate a total of 12,500,000 net tons, of which 10,400,000 tons is bituminous coal and 2,100,000 is anthracite. Revised estimates for the third week show 10,365,000 tons of bituminous and 2,003,000 tons of anthracite.

Orders Rates Cancelled

Washington, Oct. 31.—The interstate commerce commission has found not justified the proposed increase in freight rates on iron and steel articles from Utah common points to California destinations and has ordered cancelled the tariffs it suspended last May 26. The Utah Steel Co., Midvale, Utah., protested successfully the proposed increases by the Southern Pacific and Santa Fe railroads.

Upholds Cast Pipe Rate

Washington, Oct. 31.—In a tentative opinion an examiner for the interstate commerce commission upholds the freight rate charged on shipments of cast iron pipe from East Radford, Va., to Great Falls, Mont., between April 25 and July 9, 1917. The examiner recommends dismissal of the complaint of the Lynchburg Foundry Co. against the Norfolk & Western railroad, in which reparation was asked.

Here and There in Industry

Live Information Which Records the Expansion of Various Lines of Productive Enterprise

THE David J. Joseph Co., with headquarters at Cincinnati and branches in Youngstown, Detroit, Pittsburgh, St. Louis, Chicago, Richmond, Va., and Portsmouth, O., because of its greatly increasing volume of business, has established a pig iron and steel department, under the direct management of John R. Foster, formerly of the National Sales & Trading Co. to handle all grades of pig iron, billets, slabs, and sheet bars, iron and steel. The plate and sheet department, also just established, will be under the direction of G. C. Tinsley formerly of Commercial Shearing & Stamping Co. and will specialize in plates, plate ends and sheets, and sheared plates.

* * *

CONTRACT to furnish a water purification and softening system for the boiler house of the new sewage disposal plant power house of the Milwaukee municipal sewerage plant, has been taken by the Wayne Tank & Pump Co., Fort Wayne, Ind.

* * *

AN ORDER for a 3-ton Heroult electric furnace to be shipped to the Tata Iron & Steel Co., Jamshedpur, India, has been booked by the American Bridge Co. The Tata company will use the furnace for melting ferromanganese.

* * *

WORK has been started by Dwight Robinson & Co., Inc., on the design and construuction of an extension to the plant of the American Rolling Mill Co. at Ashland, Ky. The extension will include a jobbing and sheet mill, and a galvanizing plant.

* * *

CAST iron pipe fittings now are being manufactured by the Vaughn Foundry Corp., Norwich, Conn. The company, which operates a gray iron foundry, has been doing a general jobbing on machinery castings, castings for contractors, etc. W. Russell Baird has taken charge of the plant, succeeding A. A. McDiarmid.

* * *

AT ITS annual meeting, Oct. 25, the Hendee Mfg. Co., Springfield, Mass., elected the following officers: President, Henry H. Skinner; vice president, William E. Gilbert; vice president and general manager, Frank J. Weschler; treasurer, John D. Stephens; secretary, Parmly Hanford; directors, the first three named officers and William F. Bartholomew, Boston, and Howard R. Bemis, Charles W. Bosworth, and Lindsley Hopkins, Atlanta, the latter being a new member of the board.

* * *

THE Habirshaw Electric Cable Co., Bridgeport, Conn., which is operating full time, with a normal force, by the receivers, J. B. Johnston and John S. Worrley, is to be reorganized and placed upon such a financial basis as will warrant its continued operation, by a committee of five, representing the debenture holders, note holders and general creditors. The committee is R. A. Potter, Jr., New York, F. J. Leary, T. K. Stevenson of the Western Electric Co., and T. E. Quisenberry, Chicago.

* * *

THE Consolidated Tool Works, Inc., 296 Broadway, New York, announces the appointment of sales representatives as follows: William H. Thompson, formerly with the Union Hardware Co., Torrington, Conn., in New York City; Howard A. Postley, formerly with the Knickerbocker Mfg. Co., Belleville, N. J., in the New England states; William L. Rubin, formerly with the Jacobs Scale Co., New York, in New York, Pennsylvania, Maryland, District of Columbia, and parts of West Virginia and Ohio, and Charles Alburtus, formerly with the American Safety Razor Co., Brooklyn, for New Jersey.

* * *

THE Atlantic Works, Boston, has taken over the Bertelsen & Petersen Engineering Co., also of East Boston, and the business of the latter will be discontinued Nov. 1 and liquidated. Under the reorganization the officers of the Atlantic Works will be; President, Fred McQuesten; vice president, Jen Bertelsen; treasurer and general manager, Alfred E. Cox; agent, Edward P. Robinson; works manager, Paul J. Bertelsen; purchasing agent, Joseph M. Robinson; superintendent, George S. Webster; outside superintendent, Ralph C. Christensen; and assistant superintendent, Carl G. Hedblom.

* * *

BRASS, bronze and aluminum castings of all descriptions, high grade pattern castings and match plates are being produced by the City Foundry Co., 1299 Broad street, Hartford, Conn. The company recently started in business. Partners in the organization are W. R. Haupt and C. A. Belanger.

* * *

PRODUCTION has been started by the American Refrigerating Machine Co., Inc., 20 Sigourney street, Hartford, Conn., in its manufacture of refrigerating equipment. Edward Carlson is president, Eric S. Sandberg is vice president and general manager, and Joseph H. King is secretary and treasurer. The officers also are directors of the company.

* * *

FOR the purpose of purchasing 1500 new 40-foot steel underframe refrigerator cars, the Union Refrigerator Transit Co., Port Washington road, Milwaukee, has been granted permission by the state railroad commission to issue gold notes in the sum of $2,812,500, maturing in 1929. An order for 1000 cars will be placed at once and 500 more will be purchased early in 1923. The entire issue has been taken by Milwaukee banks and trust companies, making the proceeds available immediately.

* * *

MANUFACTURING a new type of advertising display material, the Henle Co. has taken quarters at 1838 Central avenue, Cleveland, and has incorporated under the laws of Ohio. The active officers of the company are Edward J. Henle, president, and W. G. Weisse, vice president. Mr. Henle is a former Pacific Coast advertising man and is known as an art director and an originator of advertising displays. Mr. Weisse is an experienced production man and will have personal supervision of the plant. The company uses shipboard, paint and steel in manufacturing its product which eliminates plates in color printing. The company selected Cleveland as headquarters upon solicitation of the chamber of commerce industrial development committee of which James R. Mills is chairman.

Rockefeller Jr. Favors 8-Hour Day

A sweeping statement in favor of the 8-hour day as the standard in American industry, and declaring that the 12-hour day and seven-day-week are "unnecessary, uneconomic and unjustifiable" was issued by John D. Rockefeller Jr. last week, following by only a few days his publicly expressed criticism of working conditions among the coal miners of Pennsylvania. Mr. Rockefeller's statement in regard to the 8-hour day is contained in the current issue of *Survey Graphic*, and accompanies an article by R. S. Lind, who after a personal investigation of the western oil fields arraigns the operators for long hours. Mr. Rockefeller says:

"I believe that generally speaking, the 12-hour day and the seven-day week should no longer be tolerated in industry, either from the viewpoint of public policy or of industrial efficiency; I believe that both have been proven to be unnecessary, uneconomic and unjustifiable. As a matter of general policy, subject only to the demands of occasional emergency, modern industry is justified in accepting the 8-hour day and the six-day week, as a labor standard toward which all the parties interested should steadily press. Even in those industries where the continuous process is an inevitable feature, the routine should be so adjusted that the employes can have at least one day's rest in seven and can obtain that share of leisure for self-development which accompanies the work-day of approximately eight hours.

"While the adoption of these standards may and doubtless will at first entail increased costs of production, I am confident that in the long run greater efficiency and economy will result, and that from the outset public opinion will support any industry which installs them. The same sentiment will eventually bring into line the less scrupulous and less enlightened elements in every competitive industry.

"As a private citizen and individual stockholder, I have never hesitated to state my position on these points with all the clearness at my command. I have not wittingly lost an opportunity—so far as a minority stockholder may do so—to reinforce my position on the general policy with action that would be most concrete and adequate."

Status of Unemployment Is Summarized

A study of industrial unemployment over a period of years, made by Ernest S. Bradford, member of the economic advisory committee of President Harding's conference on unemployment, issued by the department of labor, develops these conclusions:

1. Industrial wage earners in those states for which data are available lose about 10 per cent of their working time through unemployment, mainly from lack of work and exclusive of idleness due to sickness and labor disputes. On this basis, an average of at least 1,500,000 industrial wage earners in the United States are constantly unemployed, taking poor and prosperous years together.

2. Two and a half per cent of the working time of industrial wage earners appears to be lost from sickness and other disabilities, and an additional 1 per cent from labor disputes, or an average per worker from these two causes of about 10 days per year.

3. From such data as are available, it appears that partial unemployment, due to part-time operation of plants, shut-downs, time lost on account of waiting, and related causes, is responsible for a loss of about 10 per cent more of the working time of industrial wage earners. There may be some overlapping here with time lost from sickness and labor disputes.

4. There is a fairly regular seasonal decrease in employment in the manufacturing industries as a whole in midsummer and again in midwinter.

5. The unemployment due to depressional factors was more pronounced in 1920-21 than in 1907-8 or 1914-15.

According to the census of occupations of 1920 the total number of persons over 10 years of age gainfully employed in the United States is about 41,600,000. Of these there are about 30,000,000 persons who may properly be called employes, and of this number between 15,000,000 and 16,000,000 are found in the so-called "industrial group," which includes the manufacturing and mechanical industries, the extraction of minerals, and transportation. The census figures for 1920 for persons gainfully employed in these three classes are, in round numbers, as follows:

Manufacturing and mechanical industries	12,813,000
Extraction of minerals	1,090,000
Transportation	3,066,000
Total	16,969,000
Subtract employers and self-employed in these classes, estimated at about	1,065,000
Total industrial employes, about	15,904,000

Reports on Accidents

Washington, Oct. 31.—Accidents at all mills and smelters in the United States, excluding blast furnaces, brought death to 27 employes in 1921 and injuries to 4494, according to the federal bureau of mines. This compares with 61 killed and 8863 injured in 1920. At milling plants the fatality rate in 1921 was 0.50, at smelters 0.73, at outside or auxiliary plants 1.08. For the entire metallurgical industry, Pennsylvania in 1921 reported 495 employes injured, Arizona 351 injured and three killed, New Jersey 314 injured and two killed, and Missouri 272 injured and one killed.

Petroleum Output Fails

Washington, Oct. 31.—Production of petroleum in the United States in September amounted to 45,246,000 barrels of 42 gallons each compared with 46,251,000 barrels in August and 36,508,000 barrels in September, 1921, the federal geological survey reports. The daily average output was 1,508,200 barrels in September, 1,500,677 in August and 1,216,933 in September a year ago. On Sept. 30 stocks of petroleum in the United States totaled 273,264,000 barrels, against 271,901,000 on Aug. 31 and 172,784,000 on Sept. 30, 1921. The geological survey estimates September consumption at 49,610,000 barrels, compared with 50,141,000 in August and 50,093,000 in July. Imports of crude oil totaled 6,465,000 barrels in September and exports, 738,000 barrels.

Dismisses Coke Rate Case

Washington, Oct. 31.—Complaint of the Tampa Gas Co. against the director general of railroads has been dismissed by the interstate commerce commission, the commission holding that rates on foundry coke, in carloads, from Osaka, Va., to Key West and Tampa, Fla., between Feb. 11 and Aug. 29 1919, were not unreasonable. The rates were $5.30 to Tampa and $6.90 to Key West. Ninety-eight carloads of coke moved at these rates.

Gives China Trade Rules

Washington, Oct. 31.—Secretary Hoover has promulgated regulations for carrying out the provisions of the China Trade act, which grants special privileges to American firms trading in China. The act provides for exemption from federal income taxation of stock in corporations directly engaged in commerce in China, held by Chinese or American stockholders resident in China on condition the amount of money so exempted is distributed annually as a special dividend to such stockholders. To obtain the benefits of the act firms must be organized in the District of Columbia for the specific purpose of trading in China. Acting Commercial Attache Frank Rhea, at Pekin, has been designated registrar under the terms of the act, with F. R. Eldridge, chief of the far eastern division of the department, as assisant registrar.

October Tool Buying Is Larger

Equipment Orders Are More Numerous Than in September—Large Amount of Railroad Business Placed and Considerable Pending—Fair Demand from Automobile Trade in Prospect—Pending Crane Orders Large

PENDING business in machine tools and shop equipment from the automotive trade and the railroads continued to encourage machinery builders and dealers as October sales books closed. Trading during the month, while not exceptionally heavy, exceeded that of September and probably the greatest development has been the issuance of a number of active lists against which early buying is planned. Several railroads which had been considering the issuance of lists for some time now are definitely in the market and several automotive interests have indicated they are contemplating large purchases soon. Despite the fact automobile manufacturing has continued at a great pace all year, tool buying by these interests has been limited to necessities. However, several automobile builders now are engaged in expanding their respective plants and from these considerable orders are expected. Industry in general also is showing more interest in equipment.

Large Automotve Demand in Prospect

LEADING equipment buyers during October included the Ramapo Iron Works, Hillburn, N. Y.; the General Electric Co., Schenectady, N. Y.; Ford Motor Co. and the Dodge Motor Co. both of Detroit; the Nash Motors Co., Milwaukee; Hazel-Atlas Glass Co., Huntington, W. Va.; Crucible Steel Co., New York; Fairbanks, Morse Co., New York and the Titusville Iron Works, Titusville, Pa. Both the Ford Motor Co. and the Dodge company have been consistant machinery buyers all year and considerable additional business is expected from them as both have expansion programs under way. The same is true of the Nash company, which also is expanding its Milwaukee plant. Other prospective automobile business comes from the Mengel Body Co., Louisville, Ky., which is planning a body plant; the Durant Motor Co. which is planning a plant at Flint, Mich.; the Chevrolet Motor Co., Detroit, which is planning plant extensions as well as the establishment of a number of assembling plants and the Fisher Body Co., Detroit, which is building a large addition. The Studebaker Corp. also is expanding its plant but it is understood to have closed on practically all its machinery requirements. Other prospective machinery buyers include the National Tube Co., Pittsburgh; the Hoover Suction Sweeper Co., Canton, O., the Carnegie Steel Co., Pittsburgh, and the Spencer Mfg. Co., Spencer, O. These interests are all in the market with fairly large inquiries but by far most of the prospective business pending is represented in the numerous single tool inquiries whch have been coming out for some time past.

Orders From Railroads Are Outstanding

RAILROAD demand probably has been the most outstanding during the month. Purchases by these interests have been fairly large and include ones made by the Missouri, Kansas & Texas; the Baldwin Locomotive Works; Chicago, Rock Island & Pacific; Chicago, Milwaukee & St. Paul; Southern; McMyler-Interstate Co.; New York Central; Delaware & Hudson; Central of Georgia; Illinois Central and the Union Tank Car Co. Several of the foregoing such as the McMyler company, are not railroads but in view of the fact they have purchased heavy railroad tools with the intention of engaging in railroad work, such orders should be considered as coming from a railroad interest. Railroad inquiries are numerous and include ones from the Pittsburgh & Lake Erie; the Pennsylvania; the Rock Island; Santa Fe; Chicago & Northwestern; Bangor & Aroostoock; Chicago, Burlington & Quincy; Virginian and the St. Louis-Southwestern. In addition to the actual railroad business pending a number of car building and locomotive shops as well as other railroad supply and equipment manufacturers are known to be in need of equipment. Railroad buying of rolling stock and general maintenance of way supplies has been exceptionally heavy during the past few weeks, with the result plants engaged in turning out these supplies are constantly buying equipment for replacement purposes, not to speak of the demand brought about through the expansion programs under way at some plants.

Price Level Now Is Higher

HIGHER price levels for machine tools, from 10 to 15 per cent above those formerly quoted, now generally are being observed by the majority of tool manufacturers. Some of the latest manufacturers to announce price adjustments include the Lodge & Shipley Machine Tool Co.; the Bradford Machine Tool Co.; the Columbia Machine Tool Co.; the R. K. LeBlond Machine Tool Co. the Buffalo Forge Co.; the Canedy-Otto Mfg. Co. and the Avey Drilling Machine Co. To some extent the higher prices have been reflected in users entering the secondhand equipment market for their needs with the result prices for this type of tools are on the upward grade. In connection with this phase of the market dealers in used machinery are doing everything in their power to keep their stocks complete and as a result auction sales are being well attended and high prices developed. Most of the business in single tools is in secondhand equipment, although many buyers are forced to take new equipment in view of the fact secondhand machinery of quality is hard to obtain.

Crane and Hoist Demand Fair

A FAIR amount of orders for cranes and allied equipment was placed during the month. Published awards in IRON TRADE REVIEW for the month totaled 128 which compares with 112 in September. Pending business during October totaled 63 which compares with 93 in the preceding month. The railroads showed considerable interest in this type of equipment, several large orders being placed by these interests. Buying of size was engaged in by the Consolidated Machine Tool Corp., Wilmington, Del.; the Pennsylvania railroad; the New York Central; the Chicago, Milwaukee & St. Paul; Missouri, Kansas & Texas and the Chicago & Northwestern. Prospective crane and hoist demand includes 41 cranes for a tube mill at Gary, Ind.; six for the Carnegie Steel Co.; five for the Jones & Laughlin Steel Co.; several for Mackintosh-Hemphill Co. and eight for the Valentine pier at Vancouver, B. C.

Equipment Demand Still Spotty

Volume of Single Tool Orders Is Fair but New Business Develops Slowly—Additional Railroad Orders Are Placed and Early Action Expected on Pending Lists—September Metalworking Tool Exports Decline

NEW business in machine tools and shop equipment continues to come out slowly. However, while demand is spotty and orders confined principally to single tools, the volume of business being booked is fairly sizable. During the week additional railroad orders were placed. These include purchases by the Baldwin Locomotive Works, the Missouri, Kansas & Texas, the New York Central, and the Chicago, Burlington & Quincy railroads. Included in inquiry of the week are 20 molding machines for the Tennessee Coal, Iron & Railroad Co.; a number of molding machines for the American Locomotive Works, and about 20 machine tools for the Chicago & Northwestern railroad.

Plant operations continue to increase steadily and as a result machinery replacement needs are larger. This is shown by the large number of single tool inquiries in the market. General industrial inquiry of the week included a list of about 10 machines for the Neely Nut & Bolt Co., Pittsburgh, and several tools for the Ohio Injector Co., Wadsworth, O.

Export demand continues small, and includes several hobbing machines for shipment to Germany and several shapers for Holland. Figures just issued by the United States department of commerce bureau of foreign and domestic commerce for September show that metalworking tool exports during that month declined from those of August.

Outstanding business in cranes is lacking. Scattered orders of small size are noted throughout the country. However, pending business continues large and an active demand is expected in the near future.

Volume of Equipment Orders Is Unsatisfactory

NEW YORK, Oct. 31.—While machine tool business in October has shown an improvement, taking the month as a whole, it still falls short of being satisfactory. During the past week trading has been spotty. Among the outstanding orders are 10 planers, ranging from 60 to 96 inches, for the Baldwin Locomotive Works, which with several other machines went to the Niles-Bement-Pond Co., and some further substantial buying by the Missouri, Kansas & Texas railroad. A driving wheel lathe is understood to have been placed with a Philadelphia builder, for the New York Central railroad. The bulk of the machine tool requirements of the Pennsylvania railroad are still pending. Sellers in this district are figuring on a list for the Western Screw Products Co., St. Louis, whose plant recently was badly damaged by fire. Export demand includes two hobbing machines for Berlin, Germany, and two shapers for Holland, this business going to Gould & Eberhardt. Foreign buying, as a whole, remains light. Crane activity has been confined to a few scattered orders, foremost among which are six locomotive cranes for the Lock Joint Pipe Co., Ampere, N. J. New inquiry is slow.

Despite the rising tendency of equipment prices generally, few changes have yet been noted in foundry supplies. The railroads have not made purchases of consequence. At the same time, several new projects are developing slowly, and such buying as is now transacted involves principally orders for single machines, and supplies, such as flasks, etc. A recent buyer has been the American Radiator Co. closing on two sand cutters for its Buffalo plant. Another is the General Fire Extinguisher Co., Providence, R. I., which bought two 5-ton traveling cranes from the Northern Engineering Works, Detroit. Among new projects are a foundry for the Blakeslee Forging Co.

Volume of Single Tool Orders Large

CLEVELAND, Oct. 31.—Purchases of machinery, in the main, continue confined to single tools. However, as in past weeks, these are numerous and the total

Crane Awards and Inquiries of the Week

Orders Placed

One 2-ton electric crane, 22-foot span, for Brooklyn Foundry Co., Brooklyn, to Columbia Hoist & Machine Co.

Six 2-ton electric cranes, 18-foot span, for Utah Copper Co., New York, to Sprague Electric Works.

One 60-ton electric crane, 10-ton auxiliary, 71-foot span, to Whiting Corp.

Two electric cranes, one of 50 tons capacity, 60-foot span, and one of 5 tons capacity, 30-foot span, for the McIntosh-Hemphill Co., Pittsburgh, to Niles-Bement-Pond.

One 20-ton locomotive crane, 60-foot boom, for the West Virginia Pulp & Paper Co., Piedmont, W. Va., to the Industrial Works.

Four 25-ton standard locomotive cranes and two 10-ton locomotive cranes, the latter with crawler tread, all 40-foot boom, for Lock Joint Pipe Co., Ampier, N. J., to American Hoist & Derrick Co.

One 25-ton locomotive crane for Southern Power Co., Charlotte, N. C., to American Hoist & Derrick Co.

One 50-ton crane with 5-ton auxiliary for the Mackintosh-Hemphill Co., to Niles, Bement, Pond Co.

One 2-ton jib crane and one each 5-ton and 10-ton cranes for the De Roth Steel Truck & Car Wheel Co., Keystone building, Pittsburgh, for Osgood, Pa., plant of the Barber-Foster Engineering Co., Cleveland.

Orders Pending

One 5-ton and one 10-ton handpower crane for Hummel Ross Fibre Co., Hopewell, Va.; to be placed shortly through Joseph H. Wallace & Co., 3 Beekman street, New York, engineer.

One 7½-ton crane for the Universal Steel Co., Bridgeville, Pa.; bids being taken.

One 10-ton crane and one hoist for the Pennsylvania railroad, Freedom, Pa.; bids being taken.

Ten jib cranes and 10 chain block hoists for the Pennsylvania railroad; bids being taken.

One each, 50-ton, 55-foot span; 50-ton, 32-foot span; 20-ton, 100-foot span; 20-ton, 48-foot span; 25-ton, 48-foot span, and 15-ton, 48-foot span for a Pittsburgh district manufacturer; bids being taken.

Two 15-ton traveling cranes for the Apollo Steel Co., Apollo, Pa.; bids being taken.

One 5-ton crane for the O. E. Guibert Steel Co., Pittsburgh; bids being taken.

One 7½-ton crane for the A. Garrison Foundry Co., Pittsburgh; matter still held in abeyance.

One 50-ton power house crane for the Jones & Laughlin Steel Co., South Side, Pittsburgh; action deferred.

Cranes for the Wheeling Steel Corp. for Benwood, W. Va., and Martins Ferry, O.; understood that bids are being tabulated.

volume of business as a result is quite large. Grinding machinery, automatic screw machines, gear cutters, etc., appear to be in fair demand although orders of size are lacking. The automotive industry apparently is doing the bulk of the buying while the allied industries, such as parts manufacturers, are placing a fair number of orders. During the past few days automotive parts makers in this district bought a number of lapping machines and several grinders.

Prospective railroad business is fair but buying by these interests is small. Dealers here have been expecting a list to be issued by the Pennsylvania railroad for equipment for its Columbus, O., shops, but it now is understood this will not come out until after Jan. 1. Several manufacturers here are working on the requirements of the Chicago & Northwestern railroad, as well as the list recently put out by the Chicago, Burlington & Quincy. Practically the only buying by the railroads noted in this district for some time has been of single tools.

Inquiry from industry in general is large although, as with sales, most of these are for single tools. The Ohio Injector Co., Wadsworth, O., is in the market for a quantity of machinery including two drilling machines, while the Republic Structural Iron Works, Cleveland, is inquiring for a press. A number of firms throughout the district are contemplating the erection of plant additions and extensions and these projects are expected to bring out a demand for equipment. In addition to this, due to the ever-increasing operations, a demand for tools for replacement purposes is expected.

Secondhand machinery continues to be favored by buyers but more orders are going for new tools now than in many months. This, to some extent, is due to the fact secondhand machinery dealers are having some difficulty in obtaining quality machines and as a result are turning prospective buyers into new machinery channels in many instances. Auction sales continue to be well attended, both by manufacturers and dealers, and high prices are being developed at practically all such sales. Machine tool prices in general are firm at the higher levels and in some quarters even higher prices are expected to be named before the end of the year.

Tool Inquiries Are Numerous

PITTSBURGH, Oct. 31.—Plentiful inquiries, with an occasional order, feature the equipment market. One new crane inquiry calls for six cranes for a Pittsburgh district manufacturer and several single crane inquiries are before sellers. One inquiry from a railroad calls for 10 jib cranes and 10 hoists. Awards this week are few, only one or two being noted. Among the new inquiries for machine tools is a list of about 10 items from the Neely Nut & Bolt Co., Pittsburgh, including a lathe, shaper and a grinder. Railroads are expected to close within the next two weeks on the two or three lists which are pending. Most of the other inquiries before the trade call for single units, or two or three small machines at a time. Several dealers report October is proving to be a better selling month than September although some few buyers are postponing buying action. The consensus of opinion, however, seems to be that prices will be higher so that delays in purchasing will be more or less expensive.

Sales this week include several machines for the Gary tube mill which are to be shipped to the Lorain, O., plant and subsequently re-shipped to Gary, Ind. Included in this last requirement are three planers, three or four lathes, a radial drill, open-side planer and shaper, and a large boring mill. Other recent purchases involved two 24-inch lathes; two or three milling machines, a small lathe, a punch press and various other items. Deliveries on some machines are deferred from three to five months, particularly on lathes and radial drills. Some manipulators for forge shops are under negotiation as are a few coke pushers. In connection with foundry equipment, molding machine inquiries are particularly heavy, although recent orders have not been so numerous as was expected. The Tennessee Coal, Iron & Railroad Co. is negotiating for 20 molding machines and the American Locomotive Works likewise is in the market for a large number. One or two cupola and core oven propositions are before sellers, together with numerous inquiries for small equipment such as sand sifters, sand cutters, riddles, flasks, etc. The recent sale of a com-

Woodworking Machinery Exports Gain

FIGURES just issued by the United States department of commerce bureau of foreign and domestic commerce show that in July approximately 640,633 *pounds of sawmill and woodworking machinery valued at* $186,941 *were exported. This compares with* 347,702 *pounds valued at* $132,988 *during June, showing a gain in weight for July of* 292,931 *pounds and* $55,953 *in value. During July* 89,610 *pounds of sawmill machinery valued at* $25,575 *were exported which compares with* 106,401 *pounds valued at* $23,418 *in the preceding month. The following shows where the machinery was distributed during July.*

Countries	Sawmill machinery Pounds	Sawmill machinery Dollars	Other woodworking machinery Pounds	Other woodworking machinery Dollars
Belgium	....	....	5,393	1,425
Denmark	110	43	....	....
Finland	321	242	....	....
France	3,392	993	16,904	5,910
Italy	36	202	....	....
Latvia	1,966	292	....	....
Netherlands	....	....	685	355
Spain	1,630	432	114	34
England	1,135	1,582	88,183	28,608
Canada—				
Maritime province	1,240	199	8,420	1,183
Quebec and Ontario	9,116	2,758	179,041	58,257
Prairie provinces	7,767	646	1,128	496
British Columbia and Yukon	12,422	2,416	18,406	6,287
Costa Rica	141	83	465	641
Honduras	770	139	34	46
Panama	40	10	....	....
Mexico	8,931	1,409	5,677	3,430
Newfoundland and Labrador	1,100	334	25	50
Jamaica	3,220	1,118	....	....
Cuba	1,109	274	14,129	2,935
Dominican Republic	1,940	495	65	55
Haiti	....	....	8,328	1,690
Brazil	243	190	599	381
Chile	....	....	491	472
Colombia	20,781	4,316	6,796	1,477
Peru	97	234	....	....
Venezuela	....	....	89	99
British India	7,817	3,322	3,652	1,632
China	175	50	151,677	27,500
Hejaz, Arabia, etc	90	21	....	....
Hong Kong	....	....	4,686	2,733
Japan	435	786	9,179	4,187
Philippine islands	989	1,535	9,405	4,572
Siam	1,148	977	....	....
Australia	300	56	9,663	3,675
New Zealand	230	209	2,032	1,052
Belgian Kongo	515	86	....	....
British South Africa	....	....	3,008	1,658
Egypt	....	....	204	146
Portuguese East Africa	....	....	2,545	.400
Other Portuguese Africa	404	126	....	....
Total	89,610	25,575	551,023	161,386

plete foundry equipment installation to a Yukon, Pa., interest is noted.

Prospective Demand Is Encouraging

MILWAUKEE, Oct. 31.—While on the surface industrial activity, including that of metalworking plants, seems less active, there is a strong undercurrent represented by an increasing demand for floor equipment, and better prospects for new business. The fact that the season is growing late and as usual outdoor construction activity is running into a decline makes surface indications quieter. The majority of foundries and machine shops, however, have more business on books at the close of October than at any time since June 1, and in many respects their business is of better proportions and higher quality than in more than a year. Plants engaged in metal trades are busy rearranging existing buildings and equipment to make room for additional machinery to increase efficiency as well as make possible larger capacity without resorting to expensive new construction. This is bringing out a moderate volume of replacement business and demands for new machinery for piecing out present layouts. Milling machine manufacturers here are employing more men than since the spring of 1921 and expect to add more.

Burlington Railroad Placing Orders

CHICAGO, Oct. 31.—The Burlington railroad has started distribution of machine tool equipment orders called for in its inquiry of several months ago. It has placed sixteen 32-inch shapers, 25 lathes and a number of punches and shears. This represents only a small part of the inquiry and the remaining items are expected to be allotted during the coming week. The Chicago & Northwestern railroad has put out an inquiry for about 20 tools, but has not placed the business. October promises to be a dull month compared with September, the latter part of the month yielding little business in comparison with earlier weeks. Agricultural implement makers are not operating their plants actively and remain out of the market, although they are in need of considerable equipment. Such motor builders as draw their machinery from this district are not now in the market. Prices generally have been advanced from the level of midyear and builders who have not yet moved to the higher level are expected to do so shortly.

Fair Amount of Business Closed

TORONTO, Ont, Oct. 31.—Dealers in machine tools have been carrying on a successful selling campaign and have closed a favorable amount of business. Manufacturers throughout Ontario report active operations in the production of tools and equipment and many have orders on their books that will assure them of brisk operations for some time. The erection of new plants in the Dominion by British and American manufacturing interests has had a stimulating effect. In so far as small tools are concerned the demand continues on the same level as during the past few weeks with users buying both for present use and stock purposes.

The Moffat Stove Co., Denison avenue, Weston, Ont., will build an addition to cost $60,000 and is in the market for equipment for a porcelain, enameling department. The D. W. Robert Mfg. Co., Lockport, N. Y., will erect a plant at Niagara Falls, Ont., for the manufacture of knives, etc., for paper cutting, and will receive bids until March 1, 1923. The London Shipping Containers, Ltd., London, Ont., will erect a plant and is interested in equipment. The Northern Aluminum Co., 158 Sterling road, Toronto, Ont., is erecting a plate mill to cost $200,000. Plans are being prepared for a sewage disposal plant at Sandwich, Ont., to cost $150,000. McColl & Patterson are engineers.

Construction and Enterprise

Concise and Timely Business Building Opportunities from the Field of Industry

East of the Mississippi River

BIRMINGHAM, ALA.—The National Cast Iron Pipe Co. plans plant additions.

BIRMINGHAM, ALA.—Dwight P. Robinson & Co., Inc., New York, have been awarded a contract for the construction of a cement mill here for the Lehigh Portland Cement Co., Allentown, Pa. The mill will have a capacity of 1,000,000 barrels a year.

FOLEY, ALA.—The Foley Light & Power Co. plans a power house at an estimated cost of $50,000.

MONTGOMERY, ALA.—The Standard Electric Works, 17 Bibb street, plans a factory building.

HARTFORD, CONN.—The DuBarry Mfg. Co., Middlefield, Conn., has bought control of the National Hair Pin Co., of this city, and the machinery in the plant will be moved to Middlefield, where the business will be expanded.

NEW BRITAIN, CONN.—The Union Plane Co. has been incorporated for $50,000 to manufacture tools. A. F. Corbin is one of the incorporators.

NEW HAVEN, CONN.—The R. & O. Tractor Equipment Co. has been incorporated for $25,000. Harold L. Reed is one of the incorporators.

NEW HAVEN, CONN.—The New Haven Malleable Iron Co. has purchased five acres adjoining its plant to provide for future expansion.

NEW HAVEN, CONN.—The H. B. Ives Co. has awarded a contract to Sullivan & McKeon, New Haven, Conn., for a 4-story addition with a 1-story extension, 30 x 80 feet.

TORRINGTON, CONN.—American Adjustable Chase Co., Inc., has been organized for $75,000. Daniel F. Burns is one of the organizers.

AURORA, ILL.—The Aurora Steel Products Co. has increased its capital stock from $4500 to $70,000.

CHICAGO—The Chicago Machine Products Co., 12 South Jefferson street, has been incorporated by V. P. Wilkins, and others.

CHICAGO.—The Chicago Steel & Wire Co. plans a 1-story plant addition, 30 x 112 feet to cost about $15,000.

CHICAGO.—The Raymond Bros. Impact Pulverizer Co., 1319 North Branch street, has purchased land, 200 x 250 feet, which it will utilize for plant expansion.

CHICAGO.—The Mercury Mfg. Co., 4118 South Halsted street, has let a contract for a 1-story addition, 60 x 100 feet, to cost about $12,000.

CHICAGO—The Automobile Lock Co., 2216 South Michigan avenue, has been incorporated

with 50 shares of no par value by Frank R. Warren, William A. Jennings and Joseph B. Klein. The company is represented by Wiliam A. Jennings, 1610 69 West Washington street.

JOLIET, ILL.—The Rex Steel Stamping Co. has increased its capital stock from $10,000 to $15,000.

MORRISS, ILL.—Rudlow Bros. have started work on a 2-story shop building, 60 x 84 feet to cost about $22,000.

ALEXANDRIA, IND.—The Ziegler Mfg. Co. has started work on a 1-story plant addition, 60 x 200 feet to cost about $25,000.

BEDFORD, IND.—The Indiana Quarries Co. has awarded a contract for a 1-story plant building.

FT. WAYNE, IND.—The Wayne Tank & Pump Co. plans a 1-story factory building addition.

FT. WAYNE, IND.—The General Electric Co. plans a 1-story tank shop, 100 x 150 feet, to cost about $30,000.

HOPE, IND.—The Hope Light & Power Co. plans to establish a power plant here.

INDIANAPOLIS—The United States Encaustic Tile Works, 349 West Sixteenth street, plans a 2-story addition, 90 x 100 feet, to cost about $35,000.

INDIANAPOLIS.—Homer A. Woods, 19-29 South street, manufacturer of metal and electric specialties, plans a 4-story plant building, 60 x 200 feet to cost about $200,000.

KOKOMO, IND.—The Kokomo Malleable Iron Works has been incorporated with $550,000 capital stock by J. W. Johnson, Charles T. Byrne, John P. Grace, George Kingston and A. G. Scuberling.

LAFAYETTE, IND.—The car shops of the Monon railroad recently were damaged by fire.

LEBANON, IND.—Cline & Hicks plan a 1-story machine shop at an estimated cost of $40,000.

LOGANSPORT, IND.—The Logansport Radiator Equipment Co. plans a plant addition.

ASHLAND, KY.—Work has been started by Dwight P. Robinson & Co., New York, on the design and construction of an extension to the plant of the American Rolling Mill Co., here. The extension will include a jobbing and sheet mill and a galvanizing plant.

BARBOURSVILLE, KY.—The Cumberland & Manchester railroad plans a 1-story blacksmith shop addition, 20 x 30 feet, to cost about $8000.

LOUISVILLE, KY.—The Mengel Body Co. now is being organized and will erect a plant here.

CLINTON, ME.—The Maine Container Co. has been incorporated for $40,000. Napoleon St. Peter is president.

WINDHAM, ME.—The development of the falls here on the Pesumpscot River is planned by the Mallison Falls Power Co.

BALTIMORE.—The Consolidated Gas, Electric Light & Power Co. plans a 1-story power house 57 x 70 feet.

BALTIMORE—Reus Bros., 150 West Mt. Royal avenue, machinery, has let the contract for a 1-story plant addition, 59 x 81 feet.

BALTIMORE—The Bartlett Hayward Co. plans a 1-story foundry building, 202 x 262 feet.

BALTIMORE—The Hatfield Resilient Wheel Co., 431 Munsey building, plans a 1-story factory building, 50 x 100 feet, to cost $30,000.

BALTIMORE.—The Protector Non-Skid Chain Co., 1301 West Baltimore street, has been incorporated by Oscar M. Peters, Simon Greenbaum and Jerome H. Mausbach.

BALTIMORE—The Seaboard Brass & Copper Co. has been organized with $100,000 capital stock by B. H. Rollin, H. F. Bennett and C. W. Smith.

BALTIMORE.—The Richards Train Control Corp., 714 Continental building, has been incorporated with $100,000 capital stock by Harry W. Richards, Adolph G. and Leon I. Freedom.

BALTIMORE.—The Printing Press Specialty Co., 318 North Front street, has been incorporated with $100,000 capital stock by Charles Holm, Victor Sealander and Charles F. H. Bohnhardt.

HAGERSTOWN, MD.—The Jamison Cold Storage Door Co. is reported planning a plant addition.

BOSTON.—The S. A. Woods Machine Co., 17-19 Damrell street, plans a 1-story addition.

BOSTON.—The Tileston & Hollingsworth Co. has let the contract for a 1-story machine room extension to cost $30,000.

BOSTON.—The J. J. Walsh Co., 1540 Columbus avenue, plans a 2-story addition 50 x 100 feet to cost about $30,000.

BOSTON—Peters & Russell, Inc., has been organized for $50,000 to deal in all kinds of buffing and polishing wheels. Paul S. Peters is president.

BOSTON—The Boice Motor Equipment Co. has been incorporated with $100,000 capital

Warehouse Steel Prices

Quotations in Cents Per Pound at Leading Market Centers

STEEL BARS

Boston	3.065c
Buffalo	3.10c
Chicago	2.80c
Cincinnati	2.95c to 3.10c
Cleveland	2.91c
Detroit	3.00c
New York	3.04c
Philadelphia	3.025c
San Francisco	3.40c
Seattle	3.60c
St. Louis	2.90c
St. Paul	3.05c
Los Angeles	3.30c

IRON BARS

Boston	3.165c
Buffalo	3.10c
Chicago	2.80c
Cincinnati	3.10c
Detroit	3.00c
New York	3.04c
Philadelphia	3.025c
St. Louis	2.90c

SHAPES, STRUCTURAL

Boston	3.165c
Buffalo	3.20c
Chicago	2.90c
Cincinnati	3.05c to 3.20c
Cleveland	3.01c
Detroit	3.10c
New York	3.14c
Philadelphia	3.125c
San Francisco	3.40c
Seattle	3.60c
St. Louis	3.00c
St. Paul	3.15c
Los Angeles	3.60c

PLATES

Boston	3.165c
Boston 3/16-inch	3.04c
Buffalo	3.20c
Chicago	2.90c
Cincinnati	2.95c to 3.20c
Cleveland	3.01c
Detroit	3.10c
New York	3.14c
Philadelphia	3.125c
San Francisco	3.50c
Seattle	3.60c
St. Louis	3.00c
St. Paul	3.15c
Los Angeles	3.65c

NO. 10 BLUE ANNEALED SHEETS

Boston, 3/16-inch	4.15c
Buffalo	4.05c
Chicago	4.00c
Cincinnati	3.75c to 4.00c
Cleveland	3.70c to 3.76c
Detroit	3.95c
New York	4.19c
Philadelphia	3.85c
San Francisco	4.50c
Seattle	4.85c
St. Louis	4.10c
St. Paul	4.25c
Los Angeles	4.70c

NO. 28 BLACK SHEETS

Boston	5.40c
Buffalo	4.85c
Chicago	4.85c
Cincinnati	4.00c
Cleveland	4.40c
Detroit	4.90c
New York	4.90c
Philadelphia	4.60c
San Francisco	6.05c
Seattle	5.85c
St. Louis	4.95c
St. Paul	5.10c
Los Angeles	6.10c

NO. 28 GALVANIZED SHEETS

Boston	6.40c
Buffalo	5.85c
Chicago	5.85c
Cincinnati	5.20c
Cleveland	5.40c
Detroit	5.90c
New York	5.90c
Philadelphia	5.75c
San Francisco	6.90c
Seattle	6.85c
St. Louis	5.95c
Los Angeles	6.90c

BANDS

Boston	4.25c
Buffalo	3.90c
Chicago	3.55c
Cincinnati	3.70c to 3.85c
Cleveland	3.71c
Detroit	3.80c
New York	3.84c
Philadelphia	3.825c
San Francisco	4.05c
Seattle	4.35c
Los Angeles	4.40c

HOOPS

Boston	4.75c
Buffalo	4.10c
Cleveland	3.71c
Detroit	4.20c
New York	4.39c
Philadelphia	4.25c
Seattle	5.00c

COLD ROLLED SHAFTING

Boston (rounds)	4.00c
Boston (shapes)	4.50c
Buffalo	3.95c
Chicago (rounds)	3.80c
Chicago (shapes)	4.30c
Cincinnati (rounds)	3.75c
Cleveland (rounds)	3.73c
Cleveland (shapes)	4.25c
Detroit (rounds)	3.80c
Detroit (shapes)	4.30c
New York	3.90c
New York (shapes)	4.40c
Philadelphia (rounds)	3.85c
San Francisco	5.00c
Seattle	5.25c
Los Angeles	5.10c

ORGANIZED 1899

NATIONAL METAL TRADES ASSOCIATION

EXECUTIVE OFFICES - PEOPLES GAS BUILDING - CHICAGO, ILL.

This is the publication of the National Metal Trades Association, of which H. D. Sayre is commissioner, presenting periodically an excellent summary of conditions in the iron and steel trade, and the industrial and labor developments of an important character. Publications of this class especially quote repeatedly and extensively from the columns of IRON TRADE REVIEW.

"Origination of new demands," the *Iron Trade Review* reports, "is keeping up in a large way and is well distributed among various industrial activities. With their future production booked for weeks ahead, large interests find themselves unable to accept much additional tonnage."

Railroad car awards, according to the same journal, totaled 7000 for the week ending June 17. During the same period, the Sinclair oil interests ordered 65 tanks requiring 18,000 tons of steel.

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CLEVELAND

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stock to make motive appliances by William S. Boice, Roy F. Gammon and John O. Boice, Martinsville, N. J.

BOSTON—The General Alloys Co. has been incorporated with $400,000 capital stock to make castings, etc., by Henry H. Harris, Chicago, and Charles Van Stone and Edward P. Van Stone, both of Reading, Mass.

CAMBRIDGE, MASS.—The Lever Bros. Co., 176 Broadway, plans a turbine building.

CAMBRIDGE, MASS.—The Auto Truck & Wagon Co., 141 First street, plans a 1-story addition, 83 x 100 feet.

CAMBRIDGE, MASS.—F. A. Norcross, Boston, is architect for the storage and manufacturing building being erected for P. S. Shapiro.

CAMBRIDGE, MASS.—The New England Auto Parts Co., Inc., has been incorporated to build machinery with $6000 capital by Charles J. Murnane, Frank A. Gallagher and Thomas H. Chaffee, Somerville, Mass.

CHICOPEE, MASS.—Bids have closed for a laboratory building for the Moore Drop Forging Co.

DORCHESTER, MASS.—George M. Thompson, former vice president and general manager of the Wickwire Spencer Steel Corp. of Worcester, Mass., is building a steel rolling mill plant on Mildred Ave. here which will be operated in conjunction with the Tubular Rivet & Stud Co. of Boston.

FALL RIVER, MASS.—Contract has been awarded to Greany & Sherry, this city, for a machine shop and administration building for the Fall River water department.

HAVERHILL, MASS.—The Barasin Six Wheel Bull-Jine Truck Mfg. Co. has been incorporated with $100,000 capital stock by William D. Lambert, Frank W. Amazeen, T. J. Barasin, and others.

LAWRENCE, MASS.—The Champion International Paper Co. plans a machine shop 62 x 112 feet.

LYNN, MASS.—The Hoague Sprague Corp., 528 Broad street, plans a factory addition, 35 x 200 feet.

QUINCY, MASS.—The Brooks-Skinner Co. is to erect a 1-story, 100 x 242-foot factory.

SOUTH BOSTON, MASS.—The Hersey Mfg. Co. has let the contract for a 5-story, 40 x 180-foot factory addition.

SPRINGFIELD, MASS.—The Spartan Saw Works have let the contract for a mill construction, 1-story, 42 x 100-foot factory.

SPRINGFIELD, MASS.—Contract has been awarded to C. F. Carlson Co. for a power house for the Springfield Gas Light Co.

WESTFIELD, MASS.—The Delta Mfg. Co. is establishing a factory here for the manufacture of phonograph needles.

WORCESTER, MASS.—Woodbury & Co., Inc., is to erect a factory. Plans now are being made.

WORCESTER, MASS.—The Parker Wire Goods Co. is having plans prepared for a plant on the site of the former Star foundry.

ADRIAN, MICH.—The Schwarze Electric Co. is building a plant addition, 50 x 100 feet.

DETROIT—The Detroit Coil Co. contemplates a 1-story factory building.

DETROIT.—The Terstedt Mfg. Co. plans a 1-story plant addition.

DETROIT—The Rickenbacker Motor Co. is drawing plans for a 1-story factory building.

JERSEY CITY, N. J.—The Erie railroad plans a 1-story lathe shop here.

JERSEY CITY, N. J.—The Tiffany Electric Co., 131 Howell street, maker of electrical equipment, plans a 1-story plant addition.

JERSEY CITY, N. J.—The W. M. Kellogg Co., 117 West Side avenue, plans a 1-story shop building.

NEWARK, N. J.—The Cyclone Fence Co., 233 Broadway, New York, plans to establish a plant here.

ALBANY, N. Y.—Ground has been broken for a factory building for the Curran Mfg. Co.

BINGHAMTON, N. Y.—The Binghamton Foundry & Machine Co., Inc., has been incorporated with $250,000 capital stock by R. S. Cooper and others.

BROOKLYN, N. Y.—The Seaboard Foundries, Inc., has been incorporated with $110,000 capital stock by Hubert W. Eldred, 105 Fourth street, Ridfield Park, N. J., and others.

BUFFALO—The Pillsbury Flour Mills Co. plans a power house in connection with its proposed mill here.

BUFFALO.—The Chevrolet Motor Co. plans an assembling plant here, 2-stories, 335 x 900 feet.

SPRINGVILLE, N. Y.—A. C. Fisher plans a 1-story machine shop 50 x 100 feet.

CLEVELAND—The Aetna Rubber Co., 9404 Garfield boulevard, has a permit to erect a boiler house at an estimated cost of $2500.

CLEVELAND—The Hydraulic Pressed Steel Co., 8616 Florian avenue, has a permit to erect a shop addition at a cost of $15,000.

DAYTON, O.—The Advance Foundry Co. plans extensions and improvements to its plant, including the installation of new equipment.

DAYTON, O.—The M. & A. Brass Foundry Co. has been incorporated with $10,000 capital stock by John J. Hall, V. J. Sanborn, and others.

IRONTON, O.—The plant of the Ohio Refractories Co. recently was damaged by fire. It will be rebuilt.

LIMA, O.—Construction of a 3-story manufacturing building is planned by the Perfect Point Pencil Co.

LIMA, O.—Plans are being prepared for a plant of the Shappell Petroleum Products Co. which recently was damaged by fire.

LIMA, O.—The local chamber of commerce has closed negotiations with the Pittsburgh Engineering Co., Jeanette, Pa., to remove its plant to this city.

PORTSMOUTH, O.—The Portsmouth Stove & Range Co. has awarded a contract for an addition to its foundry.

SPRINGFIELD, O.—Work has been started on an addition to the plant of the Springfield Malleable Iron Co.

WARREN, O.—The Trumbull Tube Co. has been incorporated with $500 capital stock by Emma Kistler, Ruth Whitney, and others.

CHESTER, PA.—The Stauffer Chemical Co. plans a plant here including a power house.

ELLWOOD CITY, PA.—The Pressweld Products Co. has acquired the local plant of the Pennsylvania Iron & Steel Products Co.

BELLWOOD, PA.—Skagerberg Bros., Inc., have been incorporated with $25,000 capital stock to carry on a general machine shop and foundry business by Richard E. Skagerberg, John A. Skagerberg and J. Walter Skagerberg.

HAMBURG, PA.—The Pennsylvania Steel Castings Co. has been organized with $50,000 capital stock by W. Morris Deisher, W. Stewart Wray and B. L. Roth.

HUNTINGDON, PA.—Part of the foundry of the Extension Radiator Works, operated by the Pierce, Butler & Pierce Mfg. Corp., Syracuse, N. Y., recently was damaged by fire.

MARWOOD, PA.—The Highland View Mfg. Co., manufacturer of metal specialties, is erecting an addition.

OIL CITY, PA.—The Oil City Boiler Works has awarded a contract to L. O. Boquin, this city, for a 1-story addition, 60 x 75 feet.

PHILADELPHIA.—The George B. Clopp Iron Works, 3717 Filbert street, has awarded a contract for a 5-story plant building to cost about $100,000.

PITTSBURGH.—The Guibert Steel Co., Diamond Bank building, plans a plant building here.

PITTSBURGH—The Gloekler Mfg. Co. has been incorporated to manufacture refrigerators, etc., with $5000 capital stock by Karl J. Gloekler, Martin A. Gloekler and Michael Enz.

PITTSTON, PA.—The Hillside Coal & Iron Co. plans a coal breaker at an estimated cost of $100,000.

WARREN, PA.—The Seneca Oil Works plans an addition at an estimated cost of $65,000.

WHEATLAND, PA.—The Sharon Pressed Steel Corp. has been incorporated with $5000 capital stock by H. W. Torney, 903 Park avenue, New York, A. E. Swan, 599 State street, Sharon, Pa., and T. A. Pierce, 147 Shenango street, Sharpsburg, Pa.

WILLIAMSPORT, PA.—The Williamsport

Metalworking Tool Exports Decline

FIGURES just issued by the United States department of commerce bureau of foreign and domestic commerce show that in September 2313 individual metalworking tools were exported. This compares with 2456 in August, a loss of 143; 2306 in July, a gain of seven; 2464 in June, a loss of 151 and 2049 in May, a gain of 264. Individual comparisons for the five months are as follows

	Sept.	Aug.	July	June	May
Lathes	67	85	76	64	81
Boring and drilling machines	93	94	65	273	115
Planers, shapers and slotters	13	25	26	45	14
Bending and power presses	21	19	18	32	24
Gear cutters	26	10	37	15	8
Milling machines	27	36	25	39	21
Sawing machines	23	13	12	24	16
Thread cutting and screw machines	42	118	24	33	30
Punching and shearing machines	18	17	31	62	12
Power hammers	27	15	12	38	59
Rolling machines	2	1	20	1	5
Wire drawing machines	1	9	2	139	128
Polishing and burnishing machines	7	4	1	4	2
Sharpening and grinding machines	1081	1375	1062	1270	1226
Pneumatic portable tools	865	635	895	425	308
Total	2313	2456	2306	2464	2049

Announcing

The Conveyor Division of The Brown Hoisting Machinery Company. This department is now manufacturing a complete line of Belt Conveyors, Chain Conveyors, Coal Crushers, Screens, etc.

The same fine quality that is found in all material handling machinery bearing the Brownhoist mark is maintained in these new products. We now solicit your inquiries on

Conveying Equipment.

The Brown Hoisting Machinery Co., *Cleveland, O.*

Branch Offices: New York, Chicago, Pittsburgh, San Francisco, New Orleans

BROWNHOIST

MATERIAL HANDLING EQUIPMENT

Wire Rope Co. plans a 1-story addition, 80 x 140 feet to cost about $14,000.

YORK, PA.—The Brooks Forge & Machine Co. is planning a plant building.

YORK, PA.—The International Chain & Mfg. Co. has been organized by George J. Campbell and others.

PROVIDENCE, R. I.—Carpenter Electric Co., Inc., has been organized for $30,000. Walter J. Carpenter of East Providence is one of the organizers.

PROVIDENCE, R. I.—The additions planned by C. R. Makepeace & Co. will increase the carding and spinning departments of the mill about 50 per cent. The improvements include a boiler house.

PROVIDENCE, R. I.—Plans are being prepared for a 1-story, 70 x 150-foot building for the Crompton & Knowles Loom Works, to be used for erecting and storage.

EHRHARDT, S. C.—The Peoples Utility Co. has been incorporated by S. W. Copeland, D. E. Fender and others.

KNOXVILLE, TENN.—The Automotive Machine Shop plans a plant building to cost about $10,000.

MEMPHIS, TENN.—The McGregor Battery Engineering Co., 681 Marshall avenue, has completed plans for a 1-story factory building, 30 x 105 feet.

RUTLAND, VT.—The plant of the Manning Mfg. Co. was damaged by fire. The loss is $15,000.

RICHMOND, VA.—The Wheeling Corrugating Co., 801 McDonough street, plans a 2-story addition to cost about $17,000.

LYNCHBURG, W. Va.—The plant of the Lynchburg Foundry Co. recently was damaged by fire.

WHEELING, W. VA.—The B. & M. Metal Rolling Mill has been incorporated with $50,000 capital stock by William J. Braddock, Mary

Iron and Steel Prices

Iron Ore

LAKE SUPERIOR ORES
Per Gross Ton Lower Lake Ports

Old range Bessemer, 55 per cent iron	$5.95
Mesabi Bessemer, 55 per cent iron	5.70
Old Range nonbessemer, 51½ per cent iron	5.20
Mesabi nonbessemer, 51½ per cent iron	5.05

PORT HENRY IRON ORE
Per Gross Ton, f.o.b., Port Henry

Old bed 21 furnace	$5.00
Old bed concentrates, 63 per cent	5.25
Harmony, cobbed, 63 per cent	5.25
New bed, low phos., 65 per cent	7.50
Lump ore for fix	6.00

FOREIGN IRON ORE
Cents per unit, c.i.f. Atlantic ports.

Spanish low phosphorus, 52 to 54 per cent	9.50 to 10.50
Algerian low phosphorus, 52 to 54 per cent	10.50 to 11.50
Swedish and Norwegian low phosphorus, 68 per cent	11.00 to 11.50
Swedish foundry or basic, 68 per cent	9.00 to 9.50
Spanish foundry or basic, 52 to 54 per cent	8.50 to 9.50

Manganese Ore

Brazilian, 48 to 50 per cent c.i.f. Atlantic ports, 29½ cents per unit.

Indian 48 to 50 per cent c.i.f. Atlantic ports, nominal.

Caucasian, 52 per cent, c.i.f. Atlantic ports, 29 cents per unit.

Fluor Spar

85 and 5% grade

Washed gravel, Kentucky and Illinois mines, per ton	$21.50

Rivets

Structural rivets, Pittsburgh	3.00c to 3.25c
Boiler rivets, Pittsburgh	3.10c to 3.35c
Rivets, ⅞-inch and smaller	65 off to 65-5 off

Nuts and Bolts

NUTS
(Up to 1¼ and 1⅛ inches inclusive)

Hot pressed square or hexagon blank or tapped	$3.25 to $3.50 off list
Cold punched square or hexagon blank or tapped	$3.25 to $3.50 off list
Cold punched semifinished hexagon nuts ⅝-inch and larger	70-10-2½ off
Cold punched semifinished hexagon nuts ⅞-inch and smaller	70-10-5 off
Case hardened, finished, hexagon	65-5 off

Price f.o.b. Pittsburgh, Packages of 50.

CARRIAGE BOLTS
⅜ x 6 inches, smaller and shorter

Rolled thread	50-10-5 off
Cut thread	50 off
Larger and longer	50 off

MACHINE BOLTS
(⅜ x 4 inches, hot pressed nuts)

Rolled thread	60-5 off
Cut thread	50-10 off
Larger and longer	50-10 off

(⅜ x 4 inches, cold punched nuts)

Cut thread	45 off
Larger and longer	45 off
Lag screws	50-10 to 60-5 off
Plow bolts Nos. 1, 2 and 3 heads	50-5 off
Tap bolts	30 off
Bolt ends with hot pressed nuts	50-10 off
Bolt ends with cold punched nuts	45 off
Blank bolts	50-10 off
Rough stud bolts with nuts	45 off

Steel Pipe

Pittsburgh basing discounts, jobbers, carloads

	Black	Galvanized
Butt Weld		
⅛-inch	49	23½
¼ and ⅜-inch	55	29½
½-inch	60	46½
¾-inch	64	52½
1 to 3-inch	66	54½
Lap Weld		
2-inch	59	47½
2½ to 6-inch	63	51½
7 to 8-inch	60	47½
9 to 12-inch	59	46½
REAMED AND DRIFTED		
Butt Weld		
1 to 3-inch	64	52½
Lap Weld		
2-inch	57	45½
2½ to 6-inch	61	49½
EXTRA STRONG—PLAIN ENDS		
Butt Weld		
⅛-inch	45	28½
¼ and ⅜-inch	51	34½
½-inch	57	46½
¾-inch	62	51½
1 to 1½-inch	64	53½
2 to 3-inch	65	54½
Lap Weld		
2-inch	57	46½
2½ to 4-inch	61	50½
4½ to 6-inch	60	49½
7 to 8-inch	56	43½
9 to 12-inch	50	37½
DOUBLE EXTRA STRONG		
Butt Weld		
½-inch	46	36½
¾ to 1½-inch	49	39½
2 to 2½-inch	51	41½
Lap Weld		
2-inch	45	36½
2½ to 4-inch	47	38½
4½ to 6-inch	46	37½
7 to 8-inch	42	29½

Wrought Iron Pipe

Pittsburgh basing discounts, jobbers, carloads

	Black	Galvanized
THREADS AND COUPLINGS		
Butt Weld		
¼ and ⅜-inch	+ 7	+33
½-inch	26	8
¾-inch	32	17
1 to 1½-inch	34	19
Lap Weld		
1¼ and 1½-inch	Upon application	
2-inch	29	15
2½ to 6-inch	32	19
7 to 12-inch	30	17
PLUGGED AND REAMED		
Two points less than above		
EXTRA STRONG, PLAIN ENDS		
Butt Weld		
¼ and ⅜-inch	+15	+48
½-inch	25	13
¾-inch	32	18
1 to 1½-inch	34	20
Lap Weld		
2-inch	30	17
2½ to 4-inch	33	21
4½ to 6-inch	32	20
7 to 8-inch	25	13
9 to 12-inch	20	8

DOUBLE EXTRA STRONG

Butt Weld		
½-inch	+37½	+49½
¾-inch	+18	+30
1-inch	+34	+46
1¼-inch	+18	+30
1½-inch	+17	+29
Lap Weld		
2 and 2½-inch	+ 3	+15
3 to 4-inch	2	+ 7
4½ to 6-inch	1	+ 7
8-inch	+ 4	+ 8

Boiler Tubes

L. C. L. discounts. C. L. 4 points larger

STEEL	
1¾-inch	17½
2 and 2¼-inch	32
2½ to 3-inch	43
3¼ to 4-inch	48
CHARCOAL IRON	
1½-inch	+11
1¾-inch	+ 1
2 and 2¼-inch	9
2½ to 3-inch	14
3¼ to 4½-inch	16
SEAMLESS COLD DRAWN	
1-inch	51
1¼ and 1½-inch	43
1¾-inch	27
2 and 2¼-inch	30
2½ and 2¾-inch	34
3-inch	38
3¼ to 4-inch	43
4½ and 5-inch	35
SEAMLESS HOT ROLLED	
3-inch	40
3¼ to 4-inch	45

SEAMLESS STEEL MERCHANT BOILER TUBES

Extras:

Add $8 per net ton for more than four gages heavier than standard and add 10 per cent to theoretical weight.

Add 5 per cent for lengths over 24 feet and not over 26 feet.

Smaller tubes than 1-inch and lighter than standard gage to be sold at mechanical tubing list and discount.

Intermediate sizes and gages not listed above take price of next larger outside diameter and heavier gage.

SEAMLESS STEEL MECHANICAL TUBING

Base Discounts

Carbon, 0.10 to 0.20 per cent	85 off
Carbon, 0.30 to 0.40 per cent	83 off
Carbon, 0.40 to 0.50 per cent	82 off

Plus usual differentials and extras for cutting.

SEAMLESS STEEL LOCOMOTIVE AND SUPERHEATER TUBES

Net prices per foot, f.o.b. Pittsburgh

Outside diameter	Gage	Price
2-inch	12-gage	14c
2-inch	11-gage	15c
2-inch	10-gage	16c
2¼-inch	12-gage	16c
2¼-inch	11-gage	17c
2¼-inch	10-gage	19c
3-inch	7-gage	34c
1½-inch	9-gage	13¼c
5½-inch	9-gage	53c
5½-inch	9-gage	55c

Plus usual extras for forming and for long lengths.

SIVYER (S) CASTINGS

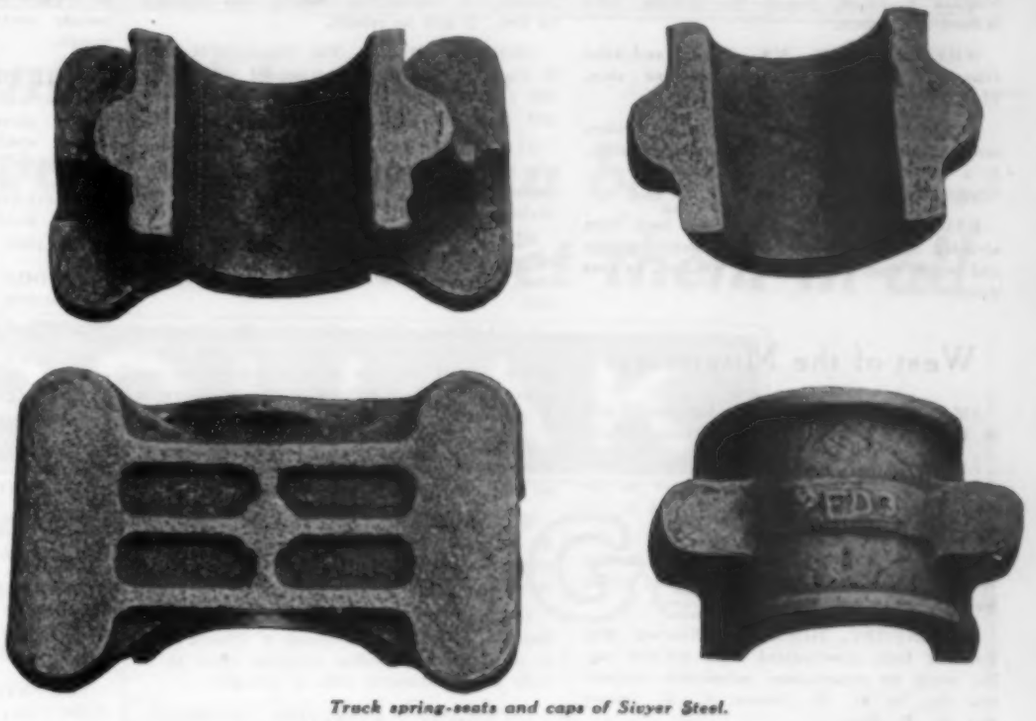
DEPENDABLE

The Sivyer Service of providing Electric Steel Castings has for its objects the decrease of machining costs and the increase of wearing-quality and life. Both are attained by methods which result from long experience and begin with the design of the casting itself, in order to make it a really practicable casting job without affecting in any way its function and efficiency.

Secondly: Sivyer Service analyzes the functions of the casting and specifies the proper composition steel for the job; long experience with carbon and alloy steels has enabled us to reduce costs and increase quality remarkably for many different industries.

Thirdly: Sivyer Service makes a careful study of the pattern and moulding problems involved, for improper gating and insufficient risers are often the greatest wasters of metal and machining labor.

Fourthly: Sivyer Service analyzes carefully the proper annealing methods to be used and controls their proper application through unfailingly efficient equipment and men. In short, the Sivyer Service supervises every step necessary to secure unfailingly good castings of electric steel. From casting-design to sand-blasting and tumbling, the fundamental superiority of Sivyer Steel is due to its men and metal. Their value is best proved by the fact that, *although the production of steel castings is generally looked upon as a local one, the Sivyer market is national.*



Truck spring-seats and caps of Sivyer Steel.

Made Continuously Since 1919

IN 1919 a truck manufacturer, who had kept complete service records on all his trucks for eight years, decided that his spring seats and caps would have to be better than iron could make them. To make these parts really break-proof for the entire lifetime of his truck required steel. Nearby steel founders, however, did not produce castings satisfactory to the manufacturing departments. When Sivyer was finally asked to make them, it was found that a change in moulding practice did away with the cause of former machining difficulties. The Sivyer castings were uniformly true, sound and clean and had the exceptional toughness that unfailing control of metal and proper annealing provide. For the past three years there has been an uninterrupted production of these spring seats and caps in Sivyer Steel—for even in 1921 the merit of this manufacturer's thoroughly built truck made possible a sales volume exceptional for the industry.

SIVYER STEEL

SIVYER STEEL CASTING COMPANY, MILWAUKEE

Virginia Braddock, Joseph W. Millard, John Millard and others.

WHEELING, W. VA.—The Hazel-Atlas Glass Co. plans a 3-story machine shop, 45 x 80 feet to cost about $50,000.

APPLETON, WIS.—Ground was broken recently for a public garage and repair shop, 80 x 90 feet, for the Herrman Motor Car Co., Superior street.

EAU CLAIRE, WIS.—Contracts have been awarded by E. F. Garton for a public garage and repair shop building, 50 x 100 feet, to cost $20,000.

West of the Mississippi

SMACKOVER, ARK.—The Arkansas Light & Power Co. plans to install a power plant.

LOS ANGELES.—The Kay-Brunner Steel Casting Co. has awarded a contract to the Austin Co. for a 1-story foundry, 56 x 152 feet.

DAVENPORT, IOWA—Davenport Cabinet Works is remodeling its factory and office building at 1223-27 East River street.

DAVENPORT, IOWA—The Norman Mfg. Co. has been incorporated with $50,000 capital stock to manufacture automobile accesories, etc., by H. M. Jerome, C. M. Jerome and M. E. Sipe.

NEW ORLEANS.—Part of the plant of the S. J. Stewart Electric Motor Co. recently was damaged by fire.

KLONDIKE, MO.—The Tavern Rock & Sand Co. plans a power house.

GREAT FALLS, MONT.—The Sico Machinery Co. has been incorporated with $50,000 capital stock by Adam Stimpert, Jescena Stimpert and Fred D. Stimpert.

YORK, NEBR.—The plant of the York Foundry & Engine Co. recently was damaged by fire. It will be rebuilt.

OKEMAH, OKLA.—The Standard Machine & Tool Co. has been incorporated with $100,000 capital stock by J. R. and E. G. McCoy and J. E. Morgan, all of Barnsdall, Okla.

TULSA, OKLA.—The Tulsa Pipe & Supply Co. has been incorporated with $100,000 capital stock by Harry Stekoll, A. Dee and Mabel Elliott.

EL PASO, TEX.—The Southern Pacific railroad has plans for a locomotive erecting shop, a roundhouse addition and a storehouse here.

PASADENA, TEX.—The Stauffer Chemical Co. has purchased 30 acres near here upon which it will build a sulphur refinery at an estimated cost of $100,000. R. E. Denmon is general manager.

TEXAS CITY, TEX.—The Humble Oil & Refining Co. plans the erection of a 75,000-barrel steel storage tank at Galveston, Tex.

TEXAS CITY, TEX.—The Terminal Oil & Refining Co. plans additional units to its topping plant and will add nine steel storage tanks.

TEXAS CITY, TEX.—The United States Gasoline Corp. has purchased a 75-acre tract as a site for a gasoline cracking plant to be built at an estimated cost of $250,000.

TEXAS CITY, TEX.—The Swiftsure Petroleum Co. has let the contract for two additional steel storage tanks, each with a capacity of 55,000 barrels.

CASPER, WYO.—The Casper Iron Foundry plans to establish a plant here on East C street. The plant building will be 30 x 60 feet, one story.

Business in Canada

CANNINGTON, ONT.—This city has employed James, Proctor & Redfern, Toronto, Ont., to prepare plans for a waterworks system to include electric equipment and turbine driven pumps.

HAMILTON, ONT.—The Efficiency Oil Burners, Ltd., has been incorporated to manufacture stoves, furnaces, etc. with $100,000 capital stock; by Cecil V. Langs, Ewart G. Binkley, Howard Morwick and others.

HAMILTON, ONT.—The Peninsular Cord Tire & Rubber Co., 45 St. John street south, plans a plant at Hanover, Ont.

LONDON, ONT.—The Carton Co., York and Glebe streets, plans a factory building which with equipment will cost about $50,000.

OTTAWA, ONT.—The Lewis Mechanical Switches, Ltd., have been incorporated to manufacture mechanical switches, etc., with $50,000 capital stock; by Redmond Quain, John Bogue, Donald A. Fraser and others.

TORONTO, ONT.—The Hall Gear & Machine Co., Ltd., has been incorporated with $150,000 capital stock by Ernest A. Hall, F. C. Hall and Norman W. Devitt.

TORONTO, ONT.—The Superior Concrete Products Co., Ltd., has been incorporated with $50,000 capital stock by Leopold Macaulay, Robert D. Moorehead and William T. Sinclair.

TORONTO, ONT.—The Canadian Weightless Pulley Co., Ltd., has been incorporated to manufacture pulleys, etc., with $100,000 capital stock by William H. Johnson, Frank L. Howe and A. T. Howe.

TORONTO, ONT.—The Master Fuel Oil Burners of Canada has been incorporated to manufacture oil burners, etc., with $50,000 capital stock by William A. Henderson, William N. Irwin and Francis D. Ungaro.

WINDSOR, ONT.—The Windsor Machine & Tool Co. is preparing plans for a plant at St. Thomas, Ont.

New Trade Publications

SERVICE—The Combustion Engineering Corp., New York, has issued a "Service Bulletin," in which the stoker manufacturer's side of the service question is presented. It is illustrated with an interesting cartoon story.

CHUCKING MACHINE—A 4-page illustrated folder has been published by the Baird Machine Co., Bridgeport, Conn., in which a 6-spindle chucking machine is described and illustrated. According to the folder this machine handles five pieces of work at one time.

PUMPS—A 32-page illustrated booklet has been published by the Dayton-Dowd Co., Quincy, Ill., in which centrifugal pumps are described and illustrated. Complete data and specifications of the various types are given as well as illustrations of a number of actual installations.

METERS—The Connersville Blower Co., Connersville, Ind., is circulating a 4-page illustrated folder in which rotary displacement meters are described and illustrated. These meters measure both natural gas and artificial gas from coal, water or coke oven plant. Principles of operation are given.

CRANE—A 6-page illustrated folder has been published by the Byers Machine Co., Ravenna, O., in which a combination crane and truck is described and illustrated. The crane is mounted on a truck of 5 tons or larger, having a minimum chassis length of 8 feet 10 inches from the rear of the driver's seat to the center of the rear axle. General specifications are given.

PANELS—Switchboard panels and supporting framework are described and illustrated in a 12-page illustrated booklet recently issued by the General Electric Co., Schenectady, N. Y. The switchboard panels appear under two general classifications, vertical and bench types. The data given in the booklet are interesting and should be of value to those contemplating switchboard installations.

STOKERS—The Combustion Engineering Corp., New York, has published a 24-page illustrated booklet in which automatic stokers are described and illustrated. The performance of these stokers on western and mid-western bituminous coals is pointed out. A number of test reports, each accompanied by corresponding curves, also are included. Illustrations of a number of installations are given in the booklet.

SCREW MACHINE PRODUCTS—The Western Automatic Machine Screw Co., Elyria, O., has published a 66-page illustrated booklet containing current price lists used by the screw manufacturers of the United States and catalog of specialties which it manufactures. These latter include set screws, square cap screws, hexagon cap screws, collar screws, bolts of various kinds, machine screws, etc. The booklet is thumb indexed. Some general information is given in the back of the booklet.

FLASK FILLING MACHINE—An illustrated folder has been published by the Osborn Mfg. Co., Cleveland, in which attention is called to the use of the company's flask-filling machine. According to the folder it is completely idle when not elevating and discharging sand; puts the sand into the flask direct from the floor; spreads the sand evenly; is controlled and operated by one man; will increase the possible number of molds, etc. It is built as a self-contained unit, equipped with its own electric motor.

INDUSTRIAL HEATING—A 44-page illustrated booklet has been published by W. S. Rockwell Co., New York, in which the elements of industrial heating are described in some detail. The material represents an effort to encourage a broader view of the principles governing the heat treatment of metallurgical, chemical and ceramic products, and the selection and use of equipment, fuel or electricity. The material is entirely technical and relates to principles and their application in practice. Data given should be of interest to all concerned with the use of heat in industrial operations.

You are entitled to these in every forging you buy— You will get them in all

POLLAK FORGINGS

Clean, Sound Steel,

Properly Controlled heating and forging,

Smooth forging close to size,

Accurate machining and hollow boring,

Scientific Annealing or Heat Treating,

Thorough inspection and Testing,

Prompt Shipments,

Satisfactory Service.

THE POLLAK STEEL COMPANY

General Offices Cincinnati
General Sales Office, Equitable Bldg., New York
Works—Cincinnati, Marion, O., Chicago

Iron and Steel Scrap Prices

CORRECTED TO TUESDAY NOON GROSS TONS DELIVERED TO CONSUMER

Steel Works Scrap

HEAVY MELTING STEEL

Birmingham	$16.50 to 17.00
Boston (dealers)	13.00 to 14.00
Buffalo	19.50 to 20.50
Chicago	18.00 to 18.50
Cincinnati	17.00 to 18.00
Cleveland	19.00 to 19.50
Eastern Pennsylvania	17.50 to 18.00
New York (dealers)	13.50 to 14.00
Pittsburgh	20.50 to 21.00
San Francisco	11.50
St. Louis	17.25 to 17.75
Valleys	21.00 to 21.50
No. 1 railroad steel New York (dealers)	14.25 to 14.75

BUNDLED SHEETS

Buffalo	$14.00 to 15.00
Cleveland (hydraulic)	16.75 to 17.25
Cincinnati	13.00 to 14.00
Eastern Pennsylvania	15.00 to 16.00
Pittsburgh	17.00 to 18.00
St. Louis	10.00 to 10.50
Valleys (hydraulic)	19.00 to 19.50

STEEL RAILS, SHORT

Birmingham	$17.00 to 17.50
Boston (dealers)	14.00 to 15.00
Chicago	20.50 to 21.00
Cincinnati	17.50 to 18.00
Cleveland	16.25 to 17.00
St. Louis	20.50 to 21.00

STOVE PLATE

Birmingham	$16.50 to 17.50
Boston (consumers)	16.00 to 17.00
Buffalo	17.00 to 18.00
Chicago	19.00 to 19.50
Cincinnati (net)	15.00 to 16.00
Cleveland	17.00 to 17.75
Eastern Pennsylvania	17.00 to 17.50
New York (dealers)	14.00 to 14.50
Pittsburgh	17.00 to 17.50
St. Louis	17.50 to 18.00

LOW PHOSPHORUS

Buffalo	$21.00 to 22.00
Cincinnati	18.00 to 18.50
Eastern Pennsylvania	22.00 to 23.00
Pitts. billet and bloom crops	25.00 to 26.00

SHOVELING STEEL

Chicago	$17.75 to 18.25
Pittsburgh	18.00 to 18.50
St. Louis	15.00 to 15.50

KNUCKLES, COUPLERS & SPRINGS

Chicago	$22.50 to 23.00
Eastern Pennsylvania	21.00 to 22.00
Pittsburgh	22.50 to 23.00
St. Louis	22.50 to 23.00

COMPRESSED SHEETS

Buffalo	$18.00 to 19.00
Chicago	15.50 to 16.00
Pittsburgh	18.50 to 19.50

FROGS, SWITCHES, GUARDS

Chicago	$18.00 to 18.50
Eastern Pennsylvania	17.50 to 18.00
St. Louis	17.50 to 18.00

BOILER PLATE, CUT

St. Louis (dealers)	$12.00 to 12.50

ANGLE BARS—STEEL

Chicago	$20.00 to 20.50
St. Louis	18.00 to 18.50

Iron Mill Scrap

RAILROAD WROUGHT

Birmingham	$19.00 to 20.00
Boston (dealers)	15.50 to 16.00
Buffalo	19.00 to 20.00
Chicago, No. 1	19.50 to 20.00
Chicago, No. 2	18.00 to 18.50
Cincinnati, No. 1	15.50 to 16.50
Cleveland, No. 1	12.00 to 12.25
Eastern Pennsylvania, No. 1	22.00 to 23.00
Pittsburgh, No. 1	19.00 to 20.00
Pittsburgh, No. 2	20.50 to 21.00
New York, No. 1 (dealers)	16.00 to 16.50
St. Louis, No. 1	19.50 to 20.00
St. Louis, No. 2	18.50 to 19.00

WROUGHT PIPE

Boston (dealers)	$10.50 to 11.00
Buffalo	14.00 to 14.50
Eastern Pennsylvania	15.00 to 15.50
New York (dealers)	11.75 to 12.25

YARD WROUGHT

Boston	$14.00 to 15.00
Eastern Pennsylvania, No. 1	19.00 to 20.00

CITY WROUGHT

New York, long	$13.50 to 14.00

BUSHELING

Buffalo, No. 1	$17.00 to 18.00
Chicago, No. 1	16.75 to 17.25
Chicago, No. 2	10.50 to 11.00
Cincinnati, No. 1	14.00 to 15.00
Cleveland, No. 1	12.75 to 13.00
Cleveland, No. 2	12.00 to 12.25
Eastern Pennsylvania, No. 1	14.50 to 15.00
Pittsburgh, No. 1	18.00 to 18.50
St. Louis, No. 1	15.75 to 16.75

MACHINE SHOP TURNINGS

Birmingham	$9.00 to 10.00
Boston (dealers)	11.50 to 12.00
Buffalo	14.50 to 15.50
Chicago	11.25 to 11.75
Cleveland	14.25 to 14.50
Cincinnati (net)	12.00 to 12.50
Eastern Pennsylvania	15.00 to 16.00
New York (dealers)	12.25 to 12.75
Pittsburgh	16.00 to 16.50
St. Louis	11.25 to 11.75
Valleys	15.75 to 16.00

CAST IRON BORINGS

Birmingham (chemical)	$15.00 to 16.00
Birmingham, borings (plain)	12.00 to 13.00
Boston (chemical)	18.00 to 19.00
Boston (dealers)	14.50 to 15.00
Buffalo	17.00 to 18.00
Chicago	14.75 to 15.25
Cincinnati (net)	12.50 to 13.00
Cleveland	15.00 to 15.50
Eastern Pennsylvania	16.00 to 16.50
Eastern Pennsylvania (chemical)	23.00 to 25.00
Pittsburgh	17.50 to 18.00
New York (dealers' price)	12.25 to 12.50
St. Louis	13.00 to 13.50
Valleys	17.25 to 17.50

MIXED BORINGS AND TURNINGS

(For blast furnace use)

Boston (dealers)	$11.50 to 12.00
Cleveland, small	15.00 to 15.25
Eastern Pennsylvania	15.00 to 15.50
New York (dealers)	12.25 to 12.75

IRON AXLES

Birmingham	$23.00 to 24.00
Boston	27.00 to 28.00
Buffalo	24.00 to 25.00
Chicago	29.50 to 30.00
Cincinnati	24.00 to 25.00
Eastern Pennsylvania	28.00 to 30.00
New York (dealers)	23.00 to 24.00
Pittsburgh	29.00 to 30.00
St. Louis	29.50 to 30.00

IRON RAILS

Buffalo	$19.00 to 20.00
Chicago	23.50 to 24.00
Cincinnati	16.00 to 17.00
Cleveland	18.00 to 18.50
St. Louis	21.50 to 22.00

PIPES AND FLUES

Chicago	$14.25 to 14.75
Cincinnati	12.00 to 13.00
Cleveland	15.00 to 15.50
St. Louis	12.00 to 12.50

RAILROAD GRATE BARS

Buffalo	$16.00 to 17.00
Chicago	19.00 to 19.50
Cleveland	17.00 to 17.75
Eastern Pennsylvania	17.00 to 17.50
New York (dealers)	12.00 to 12.50
St. Louis	17.50 to 18.00

FORGE FLASHINGS

Boston (dealers)	$10.50 to 11.00
Chicago, small	12.00 to 12.50
Cleveland	13.00 to 13.25
Cleveland, large	12.75 to 13.00

FORGE SCRAP

Boston	$10.50 to 11.00
Chicago	18.00 to 18.50
Eastern Pennsylvania, No. 1	15.50 to 16.00

ARCH BARS AND TRANSOMS

Chicago	$25.00 to 25.50
St. Louis	24.00 to 24.50

ANGLE BARS—IRON

Chicago	$24.50 to 25.00
St. Louis	24.00 to 24.50

Iron and Steel Works Scrap

AXLE TURNINGS

Boston (dealers)	$12.00 to 12.50
Buffalo	17.50 to 18.50
Chicago	15.50 to 16.00
Cleveland	17.00 to 17.25
Eastern Pennsylvania	15.00 to 16.00
Pittsburgh	18.50 to 19.50
St. Louis	13.00 to 13.50

STEEL CAR AXLES

Birmingham	$22.00 to 23.00
Boston (dealers)	23.50 to 24.50
Buffalo	21.00 to 22.00
Chicago	22.00 to 22.50
Cleveland	26.00 to 27.00
Eastern Pennsylvania	28.00 to 30.00
New York (dealers)	17.00 to 18.00
Pittsburgh	22.00 to 23.00
St. Louis	23.00 to 23.50

SHAFTING

Boston (dealers)	$18.50 to 19.50
Chicago	23.50 to 24.00
Eastern Pennsylvania	23.00 to 25.00
New York (dealers)	16.00 to 16.50
St. Louis	22.00 to 22.50

Iron Foundry Scrap

CAR WHEELS

Birmingham, iron	$19.00 to 20.00
Birmingham, tram car	22.00 to 23.00
Boston (consumers)	18.50 to 19.50
Buffalo, iron	21.00 to 22.00
Chicago, iron	25.00 to 25.50
Cincinnati	19.50 to 20.00
Cleveland, iron	13.00 to 13.50
Eastern Pennsylvania, iron	22.00 to 23.00
New York, iron (dealers)	16.00 to 17.00
Pittsburgh, iron	23.50 to 24.00
Pittsburgh, steel	22.50 to 23.50
St. Louis, iron	23.50 to 24.00

NO. 1 CAST SCRAP

Birmingham, cupola	$21.00 to 23.00
Boston (consumers)	22.00 to 23.00
Buffalo	21.00 to 22.00
Chicago, cupola	23.50 to 24.00
Cincinnati, No. 1, machinery, cupola (net)	20.00 to 21.00
Cleveland, cupola	21.00 to 21.75
Eastern Pennsylvania, cupola	23.00 to 25.00
New York, cupola (dealers)	19.50 to 20.00
Pittsburgh, cupola	23.50 to 24.00
San Francisco	26.00
St. Louis, agricultural	22.50 to 23.00
St. Louis, railroad	23.00 to 23.50
Valleys	22.00 to 22.50

HEAVY CAST

Boston (consumers)	$19.50 to 20.00
Buffalo	18.00 to 19.00
Cleveland	17.00 to 17.25
Eastern Pennsylvania	20.00 to 21.00
New York (dealers)	17.00 to 18.00
Pittsburgh	19.50 to 20.00

MALLEABLE

Boston (railroad)	$19.50 to 20.00
Buffalo	22.00 to 23.00
Chicago, railroad	24.00 to 24.50
Chicago, agricultural	24.00 to 24.50
Cincinnati, agricultural	17.00 to 18.00
Cincinnati, railroad	17.50 to 18.50
Cleveland, agricultural	18.50 to 19.00
Cleveland, railroad	20.00 to 21.00
Eastern Pennsylvania, railroad	20.00 to 21.00
Pittsburgh, railroad	21.00 to 21.50
Pittsburgh, agricultural	18.00 to 18.50
St. Louis, agricultural	21.50 to 22.00
St. Louis, railroad	21.50 to 22.00

Miscellaneous Scrap

RAILS FOR ROLLING

5 feet and over

Birmingham	$20.00 to 21.00
Boston (dealers)	15.50 to 16.00
Chicago	20.50 to 21.00
Cleveland	22.00 to 23.00
Eastern Pennsylvania	21.00 to 22.00
New York (dealers)	13.50 to 14.50
Pittsburgh district	23.00 to 24.00
St. Louis	19.50 to 20.00

LOCOMOTIVE TIRES

Chicago	$19.50 to 20.00
St. Louis	19.00 to 19.50

LOW PHOSPHORUS PUNCHINGS

Chicago	$19.50 to 20.00
Eastern Pennsylvania	22.00 to 24.00
Pittsburgh	24.00 to 25.00

LOGEMANN

Double Ram Hydraulic

Scrap-Metal Presses

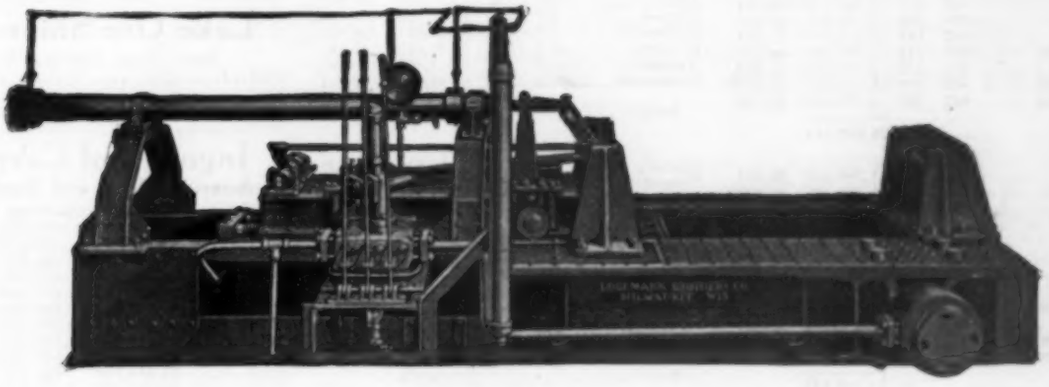
STANDARD

In Hundreds of Mills, Yards and Plants

Hydraulic-compressed scrap always commands the best prices. It is more conveniently stored—more economically handled—there is less loss from corrosion—less heat is required for remelting.

Loose Scrap is worth almost nothing.
Compare this with prices paid for "hydraulic-compressed."

LOGEMANN BROTHERS CO., 3126 Burleigh St. MILWAUKEE, WIS.



We build Balers for All Purposes

Hand-balers for waste-paper, power and hydraulic balers for the textile trades, hydraulic presses for metal and waste trades.

Also Hydraulic Shaft Straighteners, Etc.

Iron and Steel Production

Compiled By IRON TRADE REVIEW

Pig Iron

	Stacks No.	Stacks In	Output Total	Output Av. daily
1907				
January	376	311	2,174,801	69,509
February	374	308	2,047,036	73,109
March	377	304	2,186,709	70,539
April	378	327	2,226,708	74,223
May	391	329	2,291,030	73,904
June	392	341	2,237,420	74,580
July	396	335	2,253,243	72,685
August	397	329	2,243,656	72,376
September	399	329	2,174,148	72,471
October	401	314	2,359,690	76,119
November	398	226	1,820,558	60,685
December	398	154	1,234,733	39,830
Total			25,299,732	
1908				
January	398	139	1,081,813	34,316
February	401	150	1,086,809	37,476
March	398	154	1,229,856	39,672
April	398	146	1,155,122	38,504
May	396	145	1,168,002	37,677
June	395	154	1,106,300	36,876
July	397	166	1,228,604	39,632
August	399	181	1,366,019	44,065
September	399	189	1,416,252	47,208
October	400	200	1,573,824	50,764
November	402	212	1,582,314	52,744
December	403	221	1,723,664	55,602
Total			15,680,140	
1909				
January	406	234	1,787,473	57,683
February	407	233	1,682,470	60,088
March	406	229	1,822,024	58,793
April	406	224	1,731,406	57,687
May	407	236	1,866,757	60,218
June	408	240	1,929,929	64,334
July	409	258	2,088,620	67,375
August	412	278	2,232,642	72,021
September	413	297	2,378,655	79,186
October	413	309	2,589,681	84,001
November	414	311	2,532,740	84,425
December	416	314	2,682,702	86,539
Total			25,337,002	
1910				
January	416	311	2,599,995	83,871
February	417	311	2,429,525	86,747
March	417	310	2,588,736	83,580
April	418	291	2,477,700	82,590
May	421	206	1,871,388	60,367
June	420	271	2,288,279	76,276
July	420	254	2,158,124	69,617
August	422	244	2,103,793	67,864
September	420	234	2,048,461	68,282
October	421	230	2,086,205	67,297
November	421	218	1,910,385	63,679
December	421	193	1,779,899	57,192
Total			26,840,314	
1911				
January	421	210	1,766,658	56,985
February	421	226	1,781,285	63,617
March	421	236	2,165,764	69,867
April	421	220	2,044,904	68,163
May	421	206	1,871,388	60,367
June	421	202	1,773,282	59,109
July	423	196	1,776,108	57,294
August	423	206	1,921,832	61,995
September	423	216	1,973,918	65,797
October	421	214	2,092,061	67,486
November	421	214	1,999,100	66,637
December	422	215	2,032,301	65,558
Total			23,198,601	
1912				
January	421	227	2,052,806	66,220
February	422	235	2,098,796	72,372
March	420	237	2,411,529	77,791
April	421	239	2,377,621	79,254
May	423	243	2,503,341	80,753
June	424	242	2,433,737	81,125
July	422	245	2,402,567	77,502
August	423	255	2,500,163	80,650
September	419	262	2,444,454	81,482
October	422	280	2,683,645	86,569
November	423	289	2,639,562	87,985
December	423	291	2,777,292	89,590
Total			29,325,513	
1913				
January	423	297	2,287,800	89,929
February	423	306	2,778,670	92,095
March	423	278	2,562,823	89,123
April	421	297	2,754,353	91,812
May	421	285	2,716,825	90,865
June	422	283	2,816,883	87,229
July	422	264	2,658,275	82,525
August	424	260	2,537,318	81,839
September	425	258	2,594,098	83,137
October	425	244	2,439,924	81,933
November	424	225	2,529,960	74,322
December	424	191	1,976,138	63,746
Total			30,652,767	
1914				
January	423	199	1,879,336	60,624
February	423	219	1,888,607	67,450
March	423	232	2,341,551	75,534
April	422	212	2,261,501	75,383
May	422	198	2,097,019	67,646
June	422	193	1,904,566	63,486
July	422	187	1,955,324	63,075
August	422	187	1,996,483	64,403
September	422	180	1,882,718	62,757
October	422	162	1,767,227	57,007
November	421	150	1,501,269	50,042
December	421	154	1,495,325	48,236
Total			22,970,926	
1915				
January	421	165	1,591,324	51,323
February	421	179	1,666,592	59,521
March	421	190	2,046,280	66,009
April	421	197	2,114,516	70,484
May	421	207	2,255,157	72,747
June	421	221	2,369,932	78,998
July	421	234	2,563,311	82,687
August	421	246	2,774,825	89,510
September	420	266	2,834,342	94,478
October	420	276	3,120,340	100,656
November	421	285	3,035,235	101,174
December	421	295	3,201,605	103,278
Total			29,573,161	
1916				
January	421	304	3,171,878	102,319
February	421	312	3,078,548	106,157
March	422	315	3,327,630	107,343
April	422	320	3,225,496	107,517
May	423	321	3,364,584	108,535
June	423	325	3,213,818	107,127
July	419	316	3,221,127	103,907
August	419	317	3,197,838	103,156
September	419	326	3,208,041	106,935
October	419	328	3,508,180	113,167
November	420	322	3,317,805	110,593
December	422	309	3,184,178	102,715
Total			39,019,123	
1917				
January	422	310	3,159,839	101,930
February	422	317	2,649,935	94,641
March	423	331	3,255,813	105,026
April	425	333	3,328,061	110,936
May	425	340	3,413,677	110,119
June	427	347	3,260,234	108,675
July	429	351	3,337,442	107,659
August	431	355	3,238,970	104,483
September	431	344	3,140,742	104,691
October	433	354	3,296,286	106,332
November	434	344	3,198,597	106,620
December	435	321	2,885,380	93,077
Total			38,164,976	
1918				
January	435	294	2,403,227	77,523
February	435	319	2,318,242	82,794
March	438	338	3,209,996	103,548
April	437	351	3,273,355	109,112
May	437	360	3,451,884	111,351
June	437	353	3,316,148	110,538
July	437	364	3,408,584	109,954
August	439	371	3,378,479	108,983
September	438	364	3,413,223	113,774
October	437	364	3,482,392	112,335
November	437	360	3,347,844	111,595
December	435	351	3,434,114	110,602
Total			38,437,488	
1919				
January	435	330	3,306,279	106,654
February	435	311	2,943,347	105,270
March	435	279	3,088,023	99,614
April	435	216	2,474,374	82,479
May	433	197	2,107,729	67,991
June	433	199	2,114,028	70,467
July	434	240	2,424,212	78,200
August	432	266	2,742,081	88,453
September	433	163	2,480,790	82,692
October	432	216	1,864,424	60,142
November	432	252	2,407,369	80,244
December	432	262	2,626,074	84,711
Total			30,578,730	
1920				
January	432	285	3,012,373	97,172
February	432	305	2,984,257	102,904
March	433	315	3,375,768	108,895
April	433	278	2,752,670	91,754
May	433	297	2,991,825	96,510
June	433	302	3,046,623	101,553
July	434	291	3,043,918	98,190
August	434	306	3,145,536	101,168
September	434	317	3,124,308	104,173
October	435	290	3,288,341	106,075
November	435	255	2,935,081	97,836
December	435	202	2,700,268	87,105
Total			36,400,968	
1921				
January	436	184	2,414,753	77,895
February	436	155	1,927,088	68,906
March	436	103	1,593,542	51,447
April	436	96	1,190,751	39,691
May	436	90	1,215,272	39,202
June	436	74	1,064,007	35,466
July	435	69	864,642	27,892
August	435	69	954,901	30,802
September	435	84	985,795	32,857
October	435	95	1,234,450	39,821
November	429	120	1,414,958	47,165
December	429	123	1,642,775	52,992
Total			16,506,564	
1922				
January	430	127	1,545,804	53,090
February	429	139	1,630,180	58,220
March	429	155	2,034,784	65,638
April	429	161	2,070,161	69,005
May	427	175	2,309,348	74,495
June	427	191	2,362,455	78,748
July	427	170	2,403,030	77,517
August	427	143	1,810,665	58,408
September	427	188	2,016,778	67,225

Lake Ore Shipments

Gross Tons, Rail and Water

1921	22,799,077
1920	60,411,572
1919	48,546,651
1918	62,836,172

Ingots and Castings

By American Iron and Steel Institute

	Ingots	Castings	Total
1910	25,154,087	940,832	26,094,919
1911	23,029,479	646,627	23,676,106
1912	30,284,682	966,621	31,251,303
1913	30,280,130	1,020,744	31,300,874
1914	22,819,784	693,246	23,513,030
1915	31,284,212	866,824	32,151,036
1916	41,401,917	1,371,763	42,773,680
1917	43,619,200	1,441,407	45,060,607
1918	43,051,022	1,411,410	44,462,432
1919	33,694,795	976,437	34,671,232
1920	40,881,392	1,251,542	42,132,934
1921	19,184,084	559,713	19,743,797

Monthly Ingot Output

Gross Tons

1922	87.5 per cent of capacity	Indicated total
January	1,593,482	1,820,000
February	1,745,022	1,995,000
March	2,370,751	2,710,000
April	2,444,513	2,800,000
May	2,711,141	3,100,000
June	2,634,477	3,010,000
July	2,487,104	2,840,000
August	2,214,582	2,530,000
September	2,373,779	2,710,000